EFFECT MECHANISMS OF PERCEPTUAL CONGRUENCE BETWEEN INFORMATION SYSTEMS PROFESSIONALS AND USERS ON SATISFACTION WITH SERVICE

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Abstract

With the proliferation of available electronic service channels for IS users such as mobile or Intranet services in companies, service interactions between IS users and IS professionals have become an increasingly important factor for organizational business-IT alignment. Despite the increasing relevance of such interactions, the implications of agreement or disagreement on the fulfillment of critical service quality factors for successful alignment and higher user satisfaction are far from being well understood. While prior research has extensively studied the question of matching different viewpoints on IS service quality in organizations, little or no attention has been paid to the role of perceptual congruence or incongruence in the dyadic relationship between IS professionals and users in forming user satisfaction with the IS function. Drawing on cognitive dissonance theory, prospect theory and perceptual congruence research, our study examines survey responses from 169 matching pairs of IS professionals and users in different organizations and explains how perceptual fit patterns affect user satisfaction with the IS function. We demonstrate that perceptual congruence can, in and of itself, have an impact on user satisfaction which goes beyond what was found before. Moreover, our results reveal the relevance of nonlinear and asymmetric effect mechanisms arising from perceptual (in-)congruence that may affect user satisfaction. This study extends our theoretical understanding of the role of perceptual alignment or misalignment on IS service quality factors in forming user satisfaction, and lays the foundation for further study of the interplay between perceptions in the dyadic relationship between IS professionals and IS users. Managers who seek to encourage particular behaviors by the IS staff or IS users may use our results to reconcile the oftentimes troubled business-IT relationship.

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

For almost three decades, IT alignment has consistently appeared as a top concern for IT practitioners and company executives alike and the challenges of aligning the IS function with the rest of the business have been highlighted in a number of surveys [46]. Seeking consonance between different IS professionals and IS users in organizations on IS service quality has been a particularly critical management concern and a rising challenge in ensuring alignment between business and IT [10, 44]. This is especially due to the growing significance of the service component in the work of the IS function prompted by the proliferation of available electronic service channels for IS users (e.g., Intranet or mobile services), the increasing standardization of IT products, and the growing possibilities through value co-creation at the interface between service providers and service users [4, 67].

Despite the increasing importance of IT alignment on IS service quality, many organizations still grapple with poor business-IT alignment oftentimes manifested in differing perceptions of service quality factors [10]. For example, when IS professionals and users do not match in their perceptions on service responsiveness or reliability (e.g., by having differing ideas about service level fulfillment), IS investments are likely to be costly and user satisfaction may drop. In this respect, 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 [44]. 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 of clear strategic value to IS managers and researchers alike.
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., [8, 36, 
39]), only scant attention has been paid to the consequences of perceptual 
congruence or incongruence [62]. Even though important general insights have 
emerged from these initial studies, there is still a lack of research examining more 
complex cognitive effect mechanisms underlying the interactions between matching 
pairs of IS users and IS professionals that may provide new insights into effective 
social business-IT alignment [52]: Besides the effects of the magnitude of perceptual 
incongruence, does a divergence of perceptions on service quality translates into 
the same levels of user satisfaction in either direction of divergence (i.e., when IS 
users’ perceptions exceed or fall short of those of the IS professionals)? Are the 
 marginal sensitivities (or return effects) of perceptual congruence on user 
satisfaction constant irrespective of the absolute level of perceptual congruence on 
service quality? In this study, we attempt to fill this research gap by addressing the 
following research question:

RQ: How do more complex effect mechanisms (i.e., the magnitude, direction, and 
return effects) of perceptual (in-)congruence on IS service quality between matching 
pairs of IS professionals and users affect user satisfaction with the IS function?

In addressing this research question, our study provides several research and 
managerial contributions. First, our study advances previous perceptual congruence 
(e.g., [38, 39]) and socio-cognitive alignment (e.g., [52, 59]) literature in IS research 
by elucidating more complex effect mechanisms of perceptual congruence and 
incongruence on user satisfaction that have not been highlighted in past studies. 
Second, our study confirms important theoretical assumptions on the internalization 
of reference standards in matching pairs of IS users and professionals so that
cognitive dissonance theory can be used as a valid theoretical lens to explain the effects of perceptual congruence and incongruence in IT alignment research. Third, this work adds to the body of knowledge related to IS success [14] by showing that – besides established antecedents – perceptual congruence on these factors can, in and of itself, be an important source of explanation of user satisfaction. Specifically, this work responds to calls in prior research that emphasize the importance of understanding alternate (i.e., non-linear and asymmetric) mechanisms involved in users’ evaluations of their IS environment and how they contribute to forming users’ satisfaction with the IS function (e.g., [45, 53]). Finally, understanding how the interplay between matching pairs (i.e., dyads) of IS professionals and users on IS service quality affects user satisfaction can inform IS managers about how to diagnose and design the interactions between IS professionals and users to reconcile the oftentimes troubled business-IT relationship, increase continued IS usage and the organizational impact in organizations.

The remainder of the paper is organized as follows. We begin by offering a literature review on previous studies on perceptual congruence in IS research. Then we introduce the conceptual model and hypotheses based on cognitive dissonance and prospect theory. We then proceed with a discussion of the research methodology, analytical procedures used to analyze the data, and findings. Finally, we conclude with a discussion of the results, theoretical and managerial implications, and directions for future research.
Conceptual Background and Hypotheses Development

Perceptual Congruence in IS Research

The concept of perceptual congruence (the opposite is often called perceptual distance or incongruence) that generally refers to the “[...] fit, match, agreement, or similarity between two conceptually distinct constructs” ([16], p. 51) stems from early cognition and perception research in social psychology and captures the degree to which there is alignment, fit or congruence in the perceptions of the same social stimulus [57]. According to Allport [1], 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 [57]. 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 the IS staff or the quality of IS services (e.g., [8, 11, 37, 39, 62]), in the software development process [33, 55] or in business and IS planning integration [61]. 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 typically comprises the
four dimensions tangibles, reliability, responsiveness and rapport [43] the studies consistently found significant divergent perceptions with the IS personnel [8, 44].

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 effects of perceptual (in-) congruence on important outcomes for users and the IS function [44, 62]. Their results mainly show that a lack of consonance between IS professionals and users has a significant negative relation with user satisfaction. Although these studies have provided initial high-level insights into the implications of perceptual congruence and incongruence, little is known about more intricate effect mechanisms at a deeper level of understanding that occur as a result of the interplay between the perceptions of matching pairs of IS professionals and IS users. Apart from the effect of the magnitude of perceptual incongruence, does a divergence of perceptions (i.e., IS users’ perceptions exceed or fall short of those of the IS professionals) on service quality translates into the same levels of user satisfaction in either direction? Are the marginal (i.e., return) effects of perceptual congruence on user satisfaction constant independent of the absolute level of perceptual congruence on service quality?

**Theoretical Foundation and Hypotheses Development**

In this section, we develop the theoretical rationale for our research model shown in Figure 1. We first present the hypotheses related to the magnitude of congruence, followed by the hypotheses related to the direction of incongruence and to return effects of congruence.
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 first draw from cognitive dissonance theory [23]. 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 exposed to evidence that their own beliefs or attitudes may be wrong [23]. The degree of psychological discomfort usually varies in intensity based on the importance of issue and the degree of inconsistency [58]. The higher the perceived inconsistency is, the higher the felt psychological discomfort usually leading to negative consequences such as dissatisfaction. To meet the need for cognitive consistency, the psychological discomfort in individuals’ cognitions typically induces a dissonance reduction strategy by changing their beliefs, attitudes, or behaviors [23].
Several internal and external potential sources for generating dissonance have been proposed and examined in the literature, such as an individual’s own expectations (e.g., [60]), media and advertising stimuli (e.g., [29, 31]) or interactions with other individuals or groups (e.g., [48]). In situations in which social interactions are important sources for dissonance, individuals evaluate their own beliefs or behavior by comparison with the beliefs and behaviors of other related individuals or groups. Once they are exposed to such beliefs or behaviors, they may internalize them as comparison standard (i.e., reference point or anchor) that may be more or less consonant with their own beliefs and behaviors. More specifically, individuals internalize other people’s beliefs through interactions with others thereby promoting self-monitoring, self-regulation, and reflection on their own cognition.

In IS research, CDT has been used to theorize the effects of IS user expectations on their performance and perceptions with an IS [58] and the consequences of confirmation and disconfirmation of user expectations regarding IS adoption, usage and service quality (e.g., [6, 7, 63]). Different kinds of comparison standards have been put forth in past studies to examine consistency or inconsistency of IS stakeholders’ perceptions, beliefs or attitudes. Typically, 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 [9, 63]. Other scholars looked at the gap between user expectations and the ability of IS service providers to understand their desires (e.g., [49]). Ginzberg [28] 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), whereas Jiang et al. [39]
proposed a *performance gap* in which the performance perceptions of IS users are compared with those of IS professionals to determine user satisfaction.

In this study, we adopt the ‘performance gap’ 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 congruent with those of the IS professionals. When IS users interact with IS professionals, they may see their perceptions met and confirmed by the performance perceptions of the IS professionals that may be conveyed explicitly through conversations or implicitly through behavioral scripts (e.g., through fast replies or reliable problem fixes). Based on this interaction, IS users may internalize IS professionals’ perceptions as comparison standard and feel that there is a mutual understanding and thus consistency of performance perceptions on the IS service quality factors [58]. This consistency in perceptions may then lead to a state of consonance on the part of the IS user resulting in higher levels of user satisfaction [1]. Conversely, according to CDT, a state of dissonance arises when IS users’ own perceptions are inconsistent with those of the IS professionals they interact with. In such a case, IS users will experience a mental conflict prompted by the incongruence of perceptions on IS service quality. This mental conflict would cause IS users to implement a dissonance reduction strategy resulting in an adverse effect on their attitude (i.e., lower user satisfaction with the IS function). In line with CDT, both directions of perceptual incongruence (i.e., when 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 [66]. As such, we hypothesize that
**H1a-H1d:** The higher the perceptual congruence between IS users and IS professionals on the IS function’s (1a) tangibles, (1b) reliability, (1c) responsiveness, and (1d) rapport, the higher the user satisfaction with the IS function.

**Direction of Incongruence and Return Effects of Congruence**

We now turn to prospect theory to explain possible asymmetric effects on user satisfaction that may arise when (1) the perceptions of IS users diverge from those of the IS professionals (i.e., *direction of incongruence*) and (2) when the absolute level of congruence on service quality increases (i.e., *return effects of congruence*).

Prospect theory [40] is a descriptive theory in which all of the alternatives that a person faces are reduced to a series of prospects that are assessed independently. Prospect theory argues that people’s judgments and evaluations display (1) *reference dependence* (carriers of value are gains and losses), (2) *loss aversion* (losses loom larger than gains), and (3) *diminishing sensitivity* (marginal values of both gains and losses decrease with their absolute level). Gains or losses result from a comparison to a reference point; outcomes above this point are regarded as gains, outcomes below this point are treated as losses. Loss aversion means that a one-unit loss is weighted more than an equal amount of gain [21]. Kahneman and Tversky [41] for example conducted an experiment in which participants either gained or lost the same amount of money. They found that participants were more upset about losing money than happy about gaining the same amount of money. With satisfaction judgments being reference dependent too [32], prospect theory proposes that a one-unit decrease in attribute performance has a larger impact on satisfaction than an equal amount of performance increase in the same attribute.
Loss aversion is closely related to the “bad is stronger than good” principle put forth by Baumeister et al. [5]. The authors found that this principle suggesting that “bad things will produce larger, more consistent, more multifaceted, or more lasting effects than good things” ([5], p. 325) is consistent across a broad range of phenomena, including impression formation (e.g., [35]), marital relationships (e.g., [34]) and information processing (e.g., [51]). They explained this pattern in terms of evolutionary history. They suggested that individuals react more strongly to bad things because this is the adaptive response to a physical and social environment. A person who ignores the possibility of positive events may later feel regret, but nothing directly terrible is likely to happen. In contrast, a person who ignores danger even once may end up maimed or dead. In sum, both the “bad is stronger than good” principle and the “losses loom larger than gains” assumption in loss aversion have been very well recognized in various disciplines and research areas [5, 41].

Applied to understanding how the direction of perceptual incongruence on IS service quality affect user satisfaction, these principles have important implications. Specifically, it suggests a potentially critical difference between situations in which IS users have higher performance perceptions than IT professionals (i.e., perceptions above the external reference point) compared to the other way round when IS users have lower performance perceptions. In the first case, 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. According to CDT, this discrepancy of perceptions has an adverse effect on user satisfaction in comparison to perceptual congruence [63]. Experiencing that the IS professionals would rate the quality of 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 [49]. Due to this inconsistency in perceptions, a psychological discomfort may arise and cause the user to implement a dissonance reduction strategy resulting in a negative effect on user satisfaction. In the second case, 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 [39]. In line with CDT, this inconsistency of perceptions would also have an adverse effect on user satisfaction compared to perfect perceptual congruence.

Based on prospect theory, however, we would 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. Since IS users would experience relatively higher performance perceptions as potential gains (“good events”) that are, at least from the user perspective, rather unlikely to lead to serious negative consequences for the IS user or the entire business unit (such as slower IT helpdesk response times), we argue that user satisfaction will be relatively higher when IS users have higher perceptions on IS service quality compared to when they have lower perceptions than IS professionals. Therefore,

\textit{H2a-H2d: User satisfaction with the IS function will be relatively higher when the IS users’ perceptions of (2a) tangibles, (2b) reliability, (2c) responsiveness, and (2d) rapport are higher than the IS professionals’ perceptions rather than when the IS professionals’ perceptions are higher than the IS users’ perceptions.}
As discussed above, prospect theory also suggests that individuals’ performance evaluations display diminishing sensitivities (or returns), so that marginal values of performance evaluations decrease with their size [40]. This means that at high levels of perceived performance, positive performance on an attribute should not affect satisfaction as dramatically as it does at lower levels of performance. This nonlinearity has been empirically demonstrated in consumer-behavior research. For example, Mittal et al. [47] examined customer satisfaction with both health maintenance and automotive organizations and found diminishing returns for attribute-level performance. Falk et al. [22] showed in a study of online shoppers that the nature of the service quality-satisfaction link is nonlinear and asymmetric.

Analogously, we expect that the effect of perceptual congruence on user satisfaction will also have diminishing returns. At high levels of congruent service quality perceptions, a marginal increase in service quality perceptions should not affect user satisfaction as dramatically as it does at lower levels of congruent service quality perceptions. Based on the principle that “bad is stronger than good”, we argue that lower congruent performance perceptions of a service quality dimension will have more significant marginal effects on overall satisfaction than higher congruent performance perceptions. Based on Baumeister et al. [5], individuals tend to prevent and rectify bad things, and thus they are more sensitive to negative performance perceptions than to positive ones. Accordingly, we expect that

**H3a-H3d:** The congruence between IS users’ and the IS professionals’ perceptions on (3a) tangibles, (3b) reliability, (3c) responsiveness, and (3d) rapport will have diminishing marginal effects on user satisfaction with the IS function.
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 (HR) professionals at these companies to help us with sample selection and survey administration. After two e-mail reminders, 215 companies agreed to participate in our study. In the second stage, the HR professionals of these companies supported us (i.e., provided us access to relevant documents and IT systems) to randomly select matched pairs (i.e., dyads) of IS users and IS professionals at whom we separately directed our online surveys. The HR professionals were also asked to make sure that the surveys were independently completed by the selected matched pairs of 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. This, overall, should ensure a high level of IS users’ previous exposure to and interaction with a corresponding IS professional. 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 (i.e., comparing IS professionals’ and IS users’ perceptions on service
quality) 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 assessments. More specifically, to establish a salient reference point, we first asked the IS users questions on how they would assess the four service quality dimensions from the IS professional point-of-view. Only then we asked IS users to assess IS service quality based on their own performance perceptions. 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), resulting in a response rate of 8.5%.

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). As reported by the HR professionals and based on the IT systems that were available to us, the matched pairs of IS users and professionals have had a substantial number of service interactions over the last six months. Furthermore, IS users reported a high familiarity with their corresponding IS professional. To further check whether an IS user has had sufficient exposure to a corresponding IS professional, we had integrated specific questions into the user survey asking for the user’s beliefs about whether the corresponding IS professional would have lower, higher or equal perceptions about the fulfillment of each of the four IS service quality factors. Based on these answers, we compared IS users’ predictions about IS
professionals’ beliefs with how the latter actually compared to IS users’ beliefs. Except for eleven cases (out of 676, i.e., <2%), IS users’ predictions were correct indicating that they had a good grasp of IS professionals’ perceptions on IS service quality and thus it was highly likely that they internalized these perceptions as relevant reference point. The eleven cases were not excluded from further data analysis because they did not affect the results of the study.

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

<table>
<thead>
<tr>
<th>Category (Company)</th>
<th>Percent</th>
<th>Category (Respondents)</th>
<th>Statistic*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees</td>
<td></td>
<td>Socio-demographics &amp; work-related factors (IS professionals)</td>
<td></td>
</tr>
<tr>
<td>&lt; 10</td>
<td>5.4</td>
<td>Age</td>
<td>36.7 (7.1)</td>
</tr>
<tr>
<td>10 – 49</td>
<td>43.6</td>
<td>Gender</td>
<td>77.2% male</td>
</tr>
<tr>
<td>50 – 249</td>
<td>45.3</td>
<td>Work experience in months</td>
<td>91.2 (39.1)</td>
</tr>
<tr>
<td>&gt; 250</td>
<td>5.7</td>
<td># of contacts with IS users per day</td>
<td>14.7 (8.9)</td>
</tr>
<tr>
<td>Annual turnover</td>
<td></td>
<td>Socio-demographics &amp; work-related factors (IS users)</td>
<td></td>
</tr>
<tr>
<td>≤ € 2 mio.</td>
<td>13.4</td>
<td>Age</td>
<td>46.3 (9.2)</td>
</tr>
<tr>
<td>≤ € 10 mio.</td>
<td>41.6</td>
<td>Gender</td>
<td>54.1% male</td>
</tr>
<tr>
<td>≤ € 50 mio.</td>
<td>30.4</td>
<td>Work experience in months</td>
<td>77.7 (45.3)</td>
</tr>
<tr>
<td>&gt; € 50 mio.</td>
<td>14.6</td>
<td>Familiarity with corresp. IS professional 7-point Likert scale (1=low, 7=high)</td>
<td>5.2 (1.08)</td>
</tr>
<tr>
<td>Industry breakdown</td>
<td></td>
<td>Matched pairs of IS professionals and users</td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>17.4</td>
<td>Number of service episodes** (i.e., trouble tickets) in last six months</td>
<td>10.1 (4.5)</td>
</tr>
<tr>
<td>Wholesale &amp; Retail</td>
<td>13.5</td>
<td>Number of service encounters (i.e., interactions) in last six months</td>
<td>23.4 (11.3)</td>
</tr>
<tr>
<td>Financial</td>
<td>16.5</td>
<td>TIME***</td>
<td>14.2</td>
</tr>
<tr>
<td>TIME***</td>
<td></td>
<td></td>
<td>11.4</td>
</tr>
<tr>
<td>Travel &amp; Logistics</td>
<td>19.3</td>
<td></td>
<td>7.7</td>
</tr>
<tr>
<td>Real estate</td>
<td>11.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public &amp; Healthcare</td>
<td>7.7</td>
<td></td>
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</tbody>
</table>

* Except for the gender statistics, all other statistics are reported as mean values (standard deviation)
** Service episodes are defined here as sequences of encounters to solve a customer problem
*** TIME = Telecommunication, Information technology, Media, Entertainment

Non-response bias was assessed by verifying that early and late respondents were not significantly different [2]. 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). Following the recommendations of Sivo et al. [56], we also drew on the Hoppenstedt firm database to compare demographic and
socioeconomic differences (i.e., size, revenues, and industry) of non-respondents with our sample. We found that the demographic and socioeconomic variables of the firms had a similar distribution in the sample of non-respondents as those in our research sample ($p>0.05$ for distributions on size, revenue and industry respectively). Overall, these findings indicate that non-response bias is unlikely to be a major issue in this study.

**Measurement of Variables**

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 [26, 42]). 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 [39, 43]. We used perceptions-only based measures of service quality because these measures have been shown to demonstrate greater convergent and discriminant validity [13]. 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 [16], 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 the results in terms of congruence. To test for common method bias, we conducted Harman’s one-factor test [50], 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 suggesting that common-method bias is unlikely to have significantly affected our results.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Indicators</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>User satisfaction (SUM-USISF)</td>
<td>Usa1 How satisfied are you with your involvement and participation in the operation and ongoing development of information systems and applications?</td>
<td>[26, 42]</td>
</tr>
<tr>
<td></td>
<td>Usa2 How satisfied are you with the support and services of the IS unit’s computing services?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usa3 How satisfied are you with information, equipment, software, and documentation provided by your IS unit?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usa4 In summary, how satisfied are you with the entire computing systems and services environment?</td>
<td></td>
</tr>
<tr>
<td>Tangibles</td>
<td>Tan1 The IS unit has up-to-date hardware and software.</td>
<td>[39, 43]</td>
</tr>
<tr>
<td></td>
<td>Tan2 The IS unit’s physical facilities are visually appealing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tan3 Its employees are well-dressed and neat in appearance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tan4 The appearance of the physical facilities of the IS unit is in keeping with the kind of services provided.</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td>Rel1 When the IS unit promise to do something by a certain time, it does so.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rel2 The IS unit is dependable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rel3 The IS unit provides its services at the times it promises.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rel4 The IS unit insists on error-free records.</td>
<td></td>
</tr>
<tr>
<td>Responsive-ness</td>
<td>Res1 The IS unit gives prompt service to users.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Res2 The IS unit tells users exactly when services will be performed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Res3 The IS unit is always willing to help users.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Res4 It is never too busy to respond to users’ requests.</td>
<td></td>
</tr>
<tr>
<td>Rapport</td>
<td>Rap1 The IS unit has the users’ best interests at heart.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rap2 It has employees who give users individual attention.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rap3 The IS unit is consistently courteous with users.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rap4 The IS unit has the knowledge to do its jobs well.</td>
<td></td>
</tr>
</tbody>
</table>

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

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 [24]: (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).

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

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

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.

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 [24]. 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.

Table 4. Means, Standard Deviations, and Correlation Matrix

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

Note: Bolded diagonal elements are the square root of AVE; *p<0.05; **p<0.01

**Results**

**Analytical Procedures**

All hypotheses were tested with polynomial regression models and corresponding response surfaces to capture the three-dimensional relationships of IS user- and IS professional-rated IS-SQ factors with user satisfaction and provide formal tests of these relationships [15, 16]. Polynomial regression analysis (PRA) and response surface modeling (RSM) should particularly be used when nonlinearity is expected due to theory, as these methods allow to identify and uncover more complex effect patterns than simple linear models [45]. 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 which served as an unconstrained equation for a squared difference score:

\[(1) \ Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + \epsilon_0,\]

where \(Z\) indicates user satisfaction, \(X\) represents IS-user rated IS-SQ factors, and \(Y\) IS-professional rated IS-SQ factors.

Following Edwards [16], 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 (i.e., cubic) than those indicated by the model is not significant, as otherwise higher-order equations 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 Appendix A for an overview of salient features of response surfaces and how to test them). RSM analysis can lead to "elucidation of an underlying mechanism" ([30], p. 571) and uncover new and more complex patterns not evident with polynomial regression [17]. Although RSM was introduced in the management literature to overcome limitations of difference scores [16], RSM is not constrained to difference scores, but it can examine other polynomial models where relationships among variables can be modeled in three-dimensional space to offer a useful illustration.

Prior to conducting polynomial regression analyses, we centered all measures at their scale midpoints to reduce multicollinearity between the component measures and their associated higher-order terms [16]. Furthermore, single-item vectors were created for each construct by averaging each construct's items. 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 of interest, 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 [25] 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 [18, 20]. The tables in Appendix B present the results of the polynomial regression and response surface analyses, while Figures 1 and 2 in Appendix C show the plots and relevant cross sections for all four surfaces.

**Polynomial Regression Analysis**

As shown in Table 1 of Appendix B, the variance explained (\( R^2 \)) in user satisfaction was significant for all four IS-SQ factors. However, while higher-order (i.e., quadratic and interaction) terms in the polynomial regression equations for tangibles, reliability, and responsiveness accounted for significant incremental variance in user satisfaction, this was not the case in the equation for rapport (\( p>0.05 \)). Moreover, we could identify quadratic and interaction terms in the polynomial regression equations for tangibles, reliability, and responsiveness that significantly affected user satisfaction, while there were no significant higher-order terms in the equation for tangibles. 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. 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 [19]. 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: $F_{t}=1.577$, $p<0.05$; reliability: $F_{r}=1.046$, $p<0.05$; responsiveness: $F_{r}=1.215$, $p<0.05$; see the rightmost column of Table 1 in Appendix B). Overall, while quadratic regression functions adequately represented the complexity of the investigated three-dimensional relationships for tangibles, reliability and responsiveness, a simple linear regression function was appropriate for rapport. This is in line with previous studies based on prospect theory that found that perceptions of the performance on service quality dimensions can have linear or non-linear (i.e. quadratic) effects on user satisfaction depending on the type of service quality attribute under investigation [12, 47].

**Response Surface Modeling**

The surface for IS user- and IS professional-rated tangibles predicting user satisfaction, shown in Figure 1a of Appendix C, was concave (stationary point: $X_0=52.81$, $Y_0=77.73$). 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; [16]). Our analyses showed that the slope of the surface along the $Y=X$ line was positive and significant ($a_x=0.36$, $p<0.05$), 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. As indicated by the positive and significant slopes along the line of congruence, user satisfaction increased with increasing absolute levels of perceptual congruence. In addition, the non-significant curvature ($a_{x^2}=-0.02$, ns)
along the Y=X line indicated a linear relationship (i.e., constant-return effect [54]) with user satisfaction: as both components (i.e., IS users’ and IS professionals’ perceptions on tangibles) increased, the related growth in user satisfaction remained constant (see Figure 2a in Appendix C for a cross section of the line of congruence), rejecting our hypothesis on diminishing return effects for tangibles (H3a).

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 \(a_{x^2}=-0.55; p<0.05\); see Figure 2a in Appendix C for a cross section of the line of incongruence) 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 the other way round. 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 \((b_x-b_y)/2(b_x-b_y+b_y)\) [3]. 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, and contrary to our expectations, when the IS professionals’ perceptions were lower than those of the IS users, user satisfaction decreased more sharply than for the reverse. This can also be illustrated by the superimposed arrows on both sides towards the back end of the response surface.
(see Figure 1a of Appendix C). The ascent along the arrow for x>y as related to the XY plane is significantly steeper than the ascent along the arrow for x<y (α_{x>y}=51.5° vs. α_{x<y}=34.5°, p<0.05) [27]. Based on the results above, we have to reject H2a.

The response surfaces for reliability and responsiveness were also both concave (see Figures 1b and 1c in Appendix C) and quite similar in their salient features (stationary points: reliability, X₀=18.53, Y₀=12.35; responsiveness: X₀=40.91, Y₀=26.80). The slopes of the first principal axes for both reliability and responsiveness were not significantly different from unity [16], 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 (reliability: aₓ=0.35, p<0.05; responsiveness: aₓ=0.33, p<0.05), 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 H1b and H1c. Additionally, as indicated by the positive and significant slopes along the lines of congruence, user satisfaction increased with growing absolute levels of perceptual congruence. The non-significant curvatures (reliability: aₓ²=-0.02, ns; responsiveness: aₓ²=-0.03, ns) along the lines of perfect congruence for reliability and responsiveness indicated linear relationships with user satisfaction. Thus, our hypotheses on diminishing return effects for reliability and responsiveness (H3b and H3c) could not be supported.

Along the Y=-X lines, the surfaces for reliability and responsiveness were both concave and had an inverted U-shape (reliability: aₓ²=-0.59; p<0.01; responsiveness: aₓ²=-0.63; p<0.01) with slightly upward but not significant slopes at the origin (reliability: aₓ=0.59; p>0.05; responsiveness: aₓ=0.66; p>0.05). Further, user satisfaction appeared lower when IS user-rated values were much lower than
IS professional ratings than the other way round. 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., $x<y$). As such, when the IS users’ ratings were lower than the IS professional ratings, user satisfaction decreased more sharply than for the reverse (reliability: $\alpha_{x>y}=35.5^\circ$ vs. $\alpha_{x<y}=52.5^\circ$, $p<0.05$; responsiveness: $\alpha_{x>y}=36.1^\circ$ vs. $\alpha_{x<y}=54.3^\circ$, $p<0.05$), supporting H2b and H2c.

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 Appendix C) was concave, with its stationary point located at $X_0=2.48$, $Y_0=2.70$, 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 ($a_x=1.03$, $p<0.01$), 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 H1d. Further, user satisfaction was higher when ratings of IS users and IS professionals on rapport were both high, compared to when both were low. In contrast to the other three IS-SQ dimensions, the curvature ($a_{x^2}=-0.20$, $p<0.05$) along the line of congruence for rapport showed nonlinear (i.e., diminishing return) effects (see Figure 2d in Appendix C): as both components increased, the related growth in user satisfaction decreased. More specifically, the curve rose steeply from the lowest point (-3, -3), then began to decline in slope as it approached the opposite point (3, 3). This represents the case of a declining contribution to satisfaction supporting H3d.
Along the line of incongruence, the surface was slightly (but not significantly) concave \( (a_x \approx -0.18; \ p > 0.05) \) with a flat slope at the origin \( (a_x \approx -0.01; \ p > 0.05) \). As depicted by the contours on the XY plane, user satisfaction decreased almost symmetrically in both directions of incongruence (see also Figure 1d in Appendix C for the almost identical angles along the superimposed arrows: \( \alpha_{x>y} = 26.2^\circ \) vs. \( \alpha_{x<y} = 25.6^\circ, \ p > 0.05 \); see also Figure 2d in Appendix C). 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 2d, 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**

**Summary of Key Findings**

Extending socio-cognitive IT alignment literature that examined the existence of perceptual congruence between IS users and IS professionals, this study revealed complex effect mechanisms that may result as a consequence of perceptual congruence (or incongruence) on user satisfaction. This is theoretically useful by showing that perceptual congruence, and thus the matching of different perceptions on relevant evaluation criteria at the interface between business and IT can, in and of itself, have an impact on user satisfaction. Our findings (see Table 5) provide empirical support for cognitive dissonance and prospect theory and demonstrate that IS user–IS professional perceptual congruence is an important consideration in the alignment between business units and IT departments.
Table 5. Summary of Findings from Hypotheses Testing

<table>
<thead>
<tr>
<th>IS-SQ dimension</th>
<th>Effect mechanisms of perceptual (in-)congruence on user satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Magnitude</td>
</tr>
<tr>
<td></td>
<td>Results</td>
</tr>
<tr>
<td>Tangible</td>
<td>Supported</td>
</tr>
<tr>
<td>Reliability</td>
<td>Supported</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Supported</td>
</tr>
<tr>
<td>Rapport</td>
<td>Supported</td>
</tr>
</tbody>
</table>

* x represents IS users' perceptions and y IS professionals' perceptions of IS service quality factors; for example, x>y means that our findings indicated that user satisfaction was relatively higher when the IS users' perceptions of IS service quality were higher than the IS professionals' perceptions rather than the other way round.

These results support our contention that perceptual congruence between IS users and IS professionals should not simply be disregarded as irrelevant but can, above and beyond one-sided user or IT staff perceptions, have an impact on user satisfaction. Further, our results also indicate for all of the IS-SQ factors that user satisfaction with the IS function increases with higher absolute levels of perceptual congruence. These findings underscore the importance of considering absolute values of perceptions in addition to the level of fit between perceptions [63].

The study's results regarding the return effects of perceptual congruence on user satisfaction show that in dependence of the type of IS-SQ factor, IS service quality has constant or decreasing returns and thus either translates linearly or nonlinearly into user satisfaction. The effect of perceptual congruence on tangibles, reliability and responsiveness extends linearly throughout the spectra of these IS-SQ factors, whereas the effect of perceptual congruence on rapport has diminishing returns. More specifically, we identified a ceiling effect at higher levels of perceptual congruence on rapport (see the Y=X line in Figure 2d of Appendix C). In line with
prospect theory, this suggests a saturation effect reflecting the decreasing marginal utility of higher levels of rapport. Overall, these results are consistent with previous marketing and e-commerce research that found that the nature of return effects on user satisfaction may vary across different service attributes (e.g., [12, 47]).

In terms of the effects that stem from the direction of incongruence, our study revealed that if perceptual incongruence exists between IS users and professionals, there are differences in how fast user satisfaction decreases with greater distance to perfect congruence. 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 non-linear adverse effects of perceptual incongruence on user satisfaction. More specifically, our study highlights the importance of the nature of attribute (i.e., service quality factor) that is being evaluated from different perspectives for gauging the direction of perceptual incongruence and its adverse effects on user satisfaction.

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 more 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., [65]). 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 stronger detrimental impact on user satisfaction because the perceived potential vulnerability to loss incurred by the IS user and/or the business unit is comparatively higher. In contrast, we assume 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 potential vulnerabilities due to service quality failures are comparatively weaker for business units. This is, of course, a preliminary ex-post explanation and will benefit from future investigation that focuses more closely on comparing competing theoretical explanations.

**Implications for Theory and Research**

The study makes several contributions to theory and research. First, based on cognitive dissonance and prospect theories, this study offers a deeper understanding of the complex linear and non-linear effect mechanisms underlying perceptual congruence between matching pairs of IS users and IS professionals, and thus of socio-cognitive business-IT alignment [52]. 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. Although some IS research studies have investigated congruence
between perceptions of different stakeholders and simple linear effects on user satisfaction, the more complex consequences of congruence and incongruence of perceptions have received little attention so far. Our study not only answers calls for research that stress the importance of more complex mechanisms involved in users’ evaluations of their IS environment (e.g., [53]), but also extends previous perceptual congruence models by going beyond linear relationships in adding nonlinearities. These effects not only advance theory and research, but they also help explain a higher degree of variance in user satisfaction, largely because of the higher-order effects. The increased explained variance implies that perceptual congruence between IS users and professionals not only helps identify important effect patterns in business-IT alignment, but in doing so, it also better explains alignment outcomes.

This leads directly to the study’s second research contribution. In addition to IT alignment research, this study adds to IS success and satisfaction research by showing that, besides well-studied antecedents such as information, system or service quality [14], perceptual congruence on these factors may be, above and beyond these factors, an important source of explanation of user satisfaction. An important next step in IS success research may thus be to extend and verify our findings for perceptual congruence on information and system quality dimensions.

Finally, our study confirmed an important theoretical assumption of CDT that IS professionals’ perceptions of service quality performance are internalized by IS users as reference standard and contribute in conjunction with IS users’ own perceptions to affect user satisfaction. Our study thus demonstrated that CDT is a valid and relevant theoretical lens that can be used in IT alignment research to explain the effects of perceptual congruence between matching pairs of IS professionals and IS users on important alignment outcomes. Considered together,
we feel that IT alignment and IS success researchers can particularly benefit from examining the effects of perceptual congruence because they better understand how IT service supply and demand can be aligned on a dyadic, interpersonal level to effectively design more successful IS user-provider interactions.

**Implications for Practice**

Managers can learn from our study that bringing the perspectives of IS professionals and users on IS service quality factors into congruence yields higher user satisfaction with the IS function which has been shown to be a precursor to continued IS usage and higher organizational impact [7]. Organizations should thus introduce and support procedures that ascertain whether the IS professionals’ and users’ perceptions of service quality factors agree in order to reconcile the oftentimes troubled business-IT relationship [64]. Suitable procedures for this facilitation can vary in degree of formality ranging from standardized, scheduled procedures to informal, discretionary ones. For example, 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 identifying sources of discrepancies 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 professionals’ and users’ perceptions may fall short of the other parties’ perceptions with varying detrimental effects on user satisfaction. Managers should also supplement this feedback process with informal dialogue sessions between IS professionals and users (e.g., via corporate internal blogs) or formal joint retreats. Such relationship-
building activities would not only foster a shared understanding of IS service quality metrics but also an atmosphere of trust that is vital for honest quality assessments.

Managers should not only pay attention to the magnitude of perceptual congruence between IS users and IS professionals but also to the absolute levels and return effects of perceptual congruence. As our findings have shown, complacency towards absolute levels and return effects of perceptual alignment may undermine user satisfaction with the IS function in the sense that the potential to continuously increase user satisfaction over time remains unexploited. Since increasing absolute levels of perceptual congruence on IS service quality have been shown to yield significant positive returns to user satisfaction (i.e., constant returns for tangibles, responsiveness and reliability and diminishing returns for rapport), heightening the awareness and perceptions of the marginal sensitivity of different service quality factors can help managers better increase user satisfaction over the long run.

Finally, regularly examining the direction of perceptual incongruence on IS service quality can be useful for management interventions to specifically address those stakeholders that react more sensitively towards deviations from agreed-upon service quality standards. In particular, since our findings revealed that user satisfaction may be impaired differently depending on the direction of incongruence and on the type of IT service quality attribute, IT managers may allocate their time, money and efforts into those service quality improvement initiatives that promise highest marginal returns in user satisfaction.

**Limitations and Future Research**

Four limitations of the study merit consideration. First, caution should be taken when drawing conclusions from a single study. Examining the moderating role of
perceptual congruence on different evaluation attributes (e.g., system or information quality) in various institutional and cultural environments on different levels of analysis (e.g., including team and department level) could enrich our study’s findings. Future research could thus examine the generalizability of our findings in other contexts. Second, 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. Third, even though the analyses in our study showed that the direct IS service quality perceptions of IS professionals were an adequate surrogate for IS users’ perceptions on how IS professionals would rate service quality factors (i.e., indirect perceptions), we cannot completely rule out that our results are slightly up- or downward biased through minor divergences between direct and indirect perceptions. Future research should integrate further mechanisms in their study designs that avoid this potential problem and that comprehensively ensure that IS professionals’ perceptions are internalized by IS users as relevant reference point. Finally, by comparing the perceptions of IS users and IS professionals (the ‘performance gap’), we explicitly selected performance-based measurements of service quality [39]. Future research may also examine how congruence and incongruence on IS users’ and IS professionals’ service quality expectations impacts user satisfaction (the ‘expectation gap’ [28]).

**Conclusion**

This study stresses the need to take into account the nature and effects of perceptual congruence between IS users and professionals to fully comprehend the
complex effects of aligning different viewpoints on user satisfaction, thus offering new insights on complex socio-cognitive alignment processes and how they shape user satisfaction. This study aims to sensitize academics and managers in organizations 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.

References


## Appendix A. Salient Features of Response Surfaces and Relevant Analyses for Hypotheses Testing

<table>
<thead>
<tr>
<th>Salient features</th>
<th>Mathematical expression$^\dagger$</th>
<th>Interpretations / Explanations (based on [19]; [18])</th>
</tr>
</thead>
</table>
| **Stationary point** | $X_0 = \frac{b_2b_4 - 2b_3b_5}{4b_5 - b_4^2}$, $Y_0 = \frac{b_4b_5 - 2b_3b_7}{4b_5 - b_4^2}$ | - Definition: The point at which the slope of the surface is zero in all directions  
- For a concave surface, the stationary point is at the overall maximum of the surface. For a convex surface, the stationary point represents the overall minimum of the surface. For a saddle surface, the stationary point lies at the intersection of the lines along which the upward and downward curvatures of the surface are greatest  
- Stationary points help determine the general structure of a response surface. In outcome-maximizing studies (e.g., job satisfaction, behavioral intention), the stationary point helps spot the peak or dome of the surface and the corresponding ridges that lead up toward the peak. In outcome-minimizing studies (e.g., job dissatisfaction, IS expenses), the stationary point helps spot the bowl of the surface and the corresponding trough. |
| **Principal axes** (1$^{st}$ and 2$^{nd}$ principal axes) |  
1$^{st}$ principal axis: $Y = p_{10} + p_{11}X$ with  
\[ p_{11} = \frac{b_3 - b_5 + \sqrt{(b_3 - b_5)^2 + b_4^2}}{b_4} \] (slope)  
\[ p_{10} = Y_0 - p_{11}X_0 \] (intercept)  
2$^{nd}$ principal axis: $Y = p_{20} + p_{21}X$ with  
\[ p_{21} = \frac{b_3 - b_5 - \sqrt{(b_3 - b_5)^2 + b_4^2}}{b_4} \] (slope)  
\[ p_{20} = Y_0 - p_{21}X_0 \] (intercept) | - Definition: The principal axes describe the overall orientation of the surface with respect to the X, Y plane. They represent lines in the X, Y plane perpendicular to one another and intersect at the stationary point.  
- For a concave surface, the first principal axis is the line along which the downward curvature of the surface is minimized, and the second principal axis is the line along which the downward curvature of the surface is maximized. For a convex surface, the first principal axis is the line along which the upward curvature of the surface is maximized, and the second principal axis is the line along which the upward curvature of the surface is minimized. For a saddle surface, the first principal axis is the line along which the upward curvature of the surface is maximized, and the second principal axis is the line along which the downward curvature of the surface is maximized. |
| **Line of congruence (fit)** | $Y = X$ with following shape along this line:  
$Z = b_1 + (b_1 + b_2)X + (b_3 + b_4 + b_5)X^2 + e$  
where  
$ax = b_1 + b_2$ (slope at X=0, Y=0)  
$a_{x2} = b_3 + b_4 + b_5$ (curvature) | - Definition: The shape of the surface along the line of perfect congruence  
- Examining the line of congruence includes testing its slope and curvature. If $a_1$ (i.e., its slope at the origin) is significantly different from zero and positive (or negative) and $a_{x2}$ is not significant (i.e., no significant curvature), the slope of the surface is positive (negative) linear indicating that when the two predictors are in agreement, the outcome variable increases (decreases) as the predictor values increase. In addition, as indicated by a positive (negative) slope along the line of perfect congruence, the outcome variable is higher (lower) when the two predictors are both high (low) than when both are low (high). If $a_1$ and $a_{x2}$ are both not significantly different from zero, the response surface is flat along the Y=X line indicating that the outcome variable is not higher or lower when the two predictors are both high than when both are low. |
| Line of incongruence (misfit) | \( Y = -X \) with following shape along this line: \( Z = b_0 + (b_1 - b_2)X + (b_3 - b_4)X^2 + \epsilon \) where \( a_s = b_1 - b_2 \) (slope at X=0, Y=0) \( a_{s2} = b_3 - b_4 + b_1 \) (curvature) | • Definition: The shape of the surface along the line of incongruence
• Examining the line of incongruence also includes testing its slope and curvature. If \( a_s \) is not significantly different from zero (\( a_s = 0 \)) and \( a_{s2} \) is positive and significantly different from zero (\( a_{s2} > 0 \)), the response surface has a \textit{inverted U-shape} (i.e., curved downward) along the \( Y = X \) line with the highest point at \( Y = X \). If \( a_s \) is not significantly different from zero (\( a_s = 0 \)) and \( a_{s2} \) is negative and significantly different from zero (\( a_{s2} < 0 \)), the response surface is a \textit{U-shape} (i.e., curved upward) along the \( Y = X \) line with the highest point at \( Y = X \). If \( a_s \) is significantly different from zero (positive (negative)) and \( a_{s2} \) is not significantly different from zero (\( a_{s2} = 0 \)), the slope of the surface along the line of incongruence is positive (negative) linear indicating that the outcome variable increases (decreases) all along the line of incongruence.

| Lateral shift and rotation | \( \frac{p_{10}}{p_{11} + 1} \) (Point at which the 1st principal axis crosses the Y=-X line for concave surfaces) | • Studies of congruence often hypothesize that an outcome is maximized along the line of congruence implying a first principal axis that runs along the \( Y = X \) line, such that \( p_{10} = 0 \) and \( p_{11} = 1 \)
• The lateral shift of the first principal axis from the \( Y = X \) line can be gauged by the point at which the axis crosses the \( Y = X \) line (see quantity on the left). If this quantity significantly differs from zero, the surface is laterally shifted along the \( Y = X \) line.
• Rotation of the first principal axis off the \( Y = X \) line is indicated by a significant deviation of \( p_{11} \) from 1. If \( p_{11} > 1 \), the first principal axis of the surface is rotated counterclockwise; if \( p_{11} \) is not significantly different from 1, the first principal axis is parallel to the \( Y = X \) line.

|  | \( \frac{p_{20}}{p_{21} + 1} \) (Point at which the 2nd principal axis crosses the Y=-X line for convex surfaces) | • Analogously, if a hypothesis predicts that an outcome is minimized along the line of perfect congruence, the second principal axis should run along the \( Y = X \) line, meaning that \( p_{20} = 0 \) and \( p_{21} = 1 \)
• The lateral shift of the axis from the \( Y = X \) line can be gauged by the point at which the axis crosses the \( Y = X \) line (see quantity on the left). If this quantity significantly differs from zero, the surface is laterally shifted along the \( Y = X \) line.
• Rotation of the first principal axis off the \( Y = X \) line is indicated by a significant deviation of \( p_{21} \) from 1. If \( p_{21} > 1 \), the first principal axis of the surface is rotated counterclockwise; if \( p_{21} \) is not significantly different from zero, the second principal axis is parallel to the \( Y = X \) line.

|  | \( \frac{b_4 - b_2}{2(b_3 - b_4 + b_1)} \) | • The magnitude and direction of the lateral shift along the \( Y = X \) line is also given by the quantity on the left. A positive value indicates a shift toward the region where \( Y > X \), whereas a negative value indicates a shift toward the region where \( Y < X \).
• Examining this shift helps determine which type of incongruence (i.e., \( Y > X \) or \( Y < X \)) has more or less impact on the outcome variable.
• The magnitude and direction of the rotation of the surface can also be analyzed by looking at \( b_3 \), \( b_4 \) and \( b_5 \). If \( b_3 \) and \( b_4 \) are equal, then the surface does not rotate, independent of \( b_5 \). If \( b_3 \) is less than \( b_4 \), the surface rotates clockwise, otherwise it rotates counterclockwise. In either case, the magnitude of the rotation is determined not only by the difference of \( b_3 \) and \( b_4 \) but also by \( b_5 \), with larger rotations for smaller values of \( b_5 \).

Note: \(^1\) All nonstandardized beta coefficients are derived from the polynomial regression equation \( Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 \)
## Appendix B. Results from Polynomial Regression and Response Surface Analyses

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

<table>
<thead>
<tr>
<th>IS-SQ</th>
<th>$X_{b1}$</th>
<th>$Y_{b2}$</th>
<th>$X^2_{b3}$</th>
<th>$XY_{b4}$</th>
<th>$Y^2_{b5}$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$F_H$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangibles</td>
<td>-0.108</td>
<td>0.463**</td>
<td>-0.194*</td>
<td>0.265**</td>
<td>-0.093</td>
<td>0.234**</td>
<td>0.035**</td>
<td>1.577</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.472**</td>
<td>-0.121</td>
<td>-0.105</td>
<td>0.277**</td>
<td>-0.203*</td>
<td>0.221**</td>
<td>0.038**</td>
<td>1.046</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>0.494***</td>
<td>-0.169</td>
<td>-0.104</td>
<td>0.299**</td>
<td>-0.225**</td>
<td>0.254**</td>
<td>0.052**</td>
<td>1.215</td>
</tr>
<tr>
<td>Rapport</td>
<td>0.506***</td>
<td>0.520*</td>
<td>-0.097</td>
<td>-0.009</td>
<td>-0.092</td>
<td>0.450***</td>
<td>0.029</td>
<td>--</td>
</tr>
</tbody>
</table>

**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 $\Delta R^2$ 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

<table>
<thead>
<tr>
<th>IS-SQ</th>
<th>$X_0$</th>
<th>$Y_0$</th>
<th>$p_{10}$</th>
<th>$p_{11}$</th>
<th>$p_{20}$</th>
<th>$p_{21}$</th>
<th>$a_x=b_1+b_2$</th>
<th>$a_x=b_1-b_2$</th>
<th>$a_x=b_3+b_4+b_5$</th>
<th>$a_x=b_3-b_4+b_5$</th>
<th>$\Delta x$</th>
<th>$\Delta y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangibles</td>
<td>52.81*</td>
<td>77.73**</td>
<td>1.09</td>
<td>1.45</td>
<td>114.11</td>
<td>-0.69</td>
<td>0.36</td>
<td>-0.02</td>
<td>-0.57</td>
<td>-0.55</td>
<td>0.19</td>
<td>0.18</td>
</tr>
<tr>
<td>Reliability</td>
<td>18.53*</td>
<td>12.35**</td>
<td>-0.76</td>
<td>0.71</td>
<td>38.56**</td>
<td>-1.41*</td>
<td>0.35**</td>
<td>-0.03</td>
<td>0.59</td>
<td>-0.59**</td>
<td>0.39</td>
<td>0.40</td>
</tr>
<tr>
<td>Responsive.</td>
<td>40.91**</td>
<td>26.80**</td>
<td>-0.77</td>
<td>0.67</td>
<td>87.49**</td>
<td>-1.48*</td>
<td>0.33***</td>
<td>-0.03</td>
<td>0.66</td>
<td>-0.63***</td>
<td>0.62</td>
<td>0.62</td>
</tr>
<tr>
<td>Rapport</td>
<td>2.48</td>
<td>2.70</td>
<td>6.92**</td>
<td>-1.70</td>
<td>1.24</td>
<td>0.59</td>
<td>1.03**</td>
<td>-0.20**</td>
<td>-0.01</td>
<td>-0.18</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

**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. [54]; *$p<0.1$; **$p<0.05$; ***$p<0.01$. 

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Appendix C. Response Surfaces and Cross Sections

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
Figure 2. Cross Sections for Lines of Perceptual Congruence (Y=X) and Incongruence (Y=-X) regarding (2a) Tangibles, (2b) Reliability, (2c) Responsiveness, (2d) Rapport