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IT Service Climate: The Validation of an Antecedent Construct for IT Service Quality

Ronnie Jia
Southern Illinois University Carbondale, ronnie@siu.edu

Blaize Horner Reich
Simon Fraser University, breich@sfu.ca

IT SERVICE CLIMATE: THE VALIDATION OF AN ANTECEDENT CONSTRUCT FOR IT SERVICE QUALITY

Climat du service TI : la validation d'un construit antécédent de la qualité de service des TI

Completed Research Paper

Ronnie Jia
Southern Illinois University
Carbondale, Illinois 62901
ronnie@siu.edu

Blaize Horner Reich
Simon Fraser University
Burnaby, BC Canada
breich@sfu.ca

Abstract

Building from organizational climate theory, recent conceptual work has extended the IT service quality research and proposed a new construct, IT Service Climate, as an antecedent of IT service quality (Jia and Reich 2008). This paper reports on an empirical study that validated a 14-item measurement instrument for the IT service climate construct. Consisting of three dimensions, including Service Leadership, Service Vision, and Service Evaluation, the instrument demonstrates satisfactory reliability, convergent validity/unidimensionality, and discriminant validity. Data from a sample of matched pairs of systems and client units also indicate that, service climate scores from systems units explained significant variance in IT service quality as rated by their respective client units, thus demonstrating criterion validity. Contributions to both IT research and practice are discussed.

Keywords: Climate, service climate, IT service climate, service quality, SERVQUAL

Résumé

Un travail conceptuel récent (Jia et Reich, 2008) a proposé une nouvelle construction du climat du service TI. Ce papier présente une étude empirique qui démontre la validé du construit, et montre que le score de climat du service TI explique de façon significative la variance dans la qualité de service des TI, estimée par les unités clientes respectives.

Introduction

As the service quality construct and the SERVQUAL scale (Parasuraman et al. 1988) were adapted into the IT context (Kettinger and Lee 1994; Pitt et al. 1995), the resulting IS-SERVQUAL instrument has been used by organizations to measure the quality of IT service provided to business customers (Watson et al. 1998). Recent research (Jia and Reich 2008) pointed out that, after identifying a service shortfall (the "*what*"), IT managers also need to find the root causes (the "*why*") and choose appropriate corrective actions (the "*how*") – for example, a perceived lack of responsiveness may have several sources (e.g., lack of service orientation, lack of resources, or lack of knowledge). Thus, there is a need for an instrument to complement SERVQUAL, an instrument which measures the service-related factors *within* the IT function that can pinpoint the causes for service shortfalls.

Building from organizational climate theories and service climate research (e.g., Schneider et al. 1998), Jia and Reich (2008) proposed a new construct, *IT Service Climate*, as an antecedent of IT service quality. Seminal work on

service climate in the retail banking context has demonstrated a strong relationship between service climate and service quality. This program of research adapts that literature into the IT context. This paper reports on empirical work that 1) developed a measurement instrument for the IT service climate construct, and 2) tested the hypothesis that IT service climate is an antecedent of IT service quality.

This study examines the relationship between factors within the IT work environment and the level of service quality experienced by business clients. The resulting IT service climate scales will have important diagnostic value for IT managers. It may also encourage further research into the climate construct to illuminate other variables of interest in the IT domain.

We begin with a brief introduction of the IT service climate construct. Then, instrument development and hypothesis testing results are presented. The paper concludes with a discussion of its contributions to IT research and practice.

IT Service Climate (ITSC)

Organizational climate has been defined as "the shared perceptions of employees concerning the practices, procedures, and kinds of behaviors that get rewarded and supported in a particular setting" (Schneider 1990, p384), or simply, the shared perceptions of "the ways things are around here" (Reichers and Schneider 1990, p22).[1]

Climate is best regarded as a specific construct having a referent or "strategic focus" (Schneider 1975). Service climate, first conceptualized by Schneider (1973), has been the strategic climate that has received the most research attention. Cumulative research by Schneider and colleagues in the banking service context has established service climate as a predictor of service quality (Schneider and Bowen 1985; Schneider et al. 1980, 1996, 1998),

Adapting the service climate theories into the IT service context, Jia and Reich (2008) proposed a positive relationship between an IT unit's service climate and its service behavior (i.e., the IT service quality experienced by business customers) and defined IT Service Climate as *IT professionals' shared perceptions of the practices and behaviors in their workplace that support the provision of IT service to business customers.* Based on an extensive review of organizational climate literature, service marketing literature, relevant research on business-IT relationships, the IT Service Climate construct was conceptualized as having four dimensions (Table 1).

Table 1: IT Service Climate Dimensions and Definitions (Jia and Reich 2008)

Dimension	Definition	Relevant Theory	IT Literature Support
Service Leadership	The extent to which IT managers take actions to guide the delivery of quality service.	Goal setting theory, expectancy theory, path-goal theory of leadership	Abdel-Hamid et al. 1999; Boehm,1981
Service Vision	The extent to which meeting client needs, demonstrating flexibility, and establishing communication are emphasized.	Role theory	Markus and Benjamin 1996; Reich and Benbasat 2000
Client Feedback	The extent to which feedback from clients regarding service quality is solicited and addressed.	Job characteristics theory	Abdel-Hamid et al. 1999; Dennis and Kinney 1998; Ferratt and Short 1988; Kraut et al. 1982
Client Communication	The extent to which there exists an emphasis on open and frequent communication with clients regarding task-related issues.	Work climate theory (Jones and James 1979)	Boynton et al. 1994; Brown 1999; Brown and Chervany 1995; Caron et al. 1994; Markus and Benjamin 1996; Roepke et al. 2000

[1] Organizational climate and organizational culture are two related, but distinct, constructs. The term culture is often used when climate is the more appropriate term (Schein 2000). See Schneider (1990) for more discussion on this topic.

The development of construct dimensions was primarily driven by theory and prior literature, and that in empirical stages of construct development, additional themes may be uncovered, and adjustments to the proposed dimensions may also be necessary. For example, it is possible that certain proposed dimensions may have a complex structure and need to be split. It is also possible that conceptually distinct dimensions may not be empirically distinguishable and thus need to be combined. Such adjustments, if any, will be guided by both theory and empirical data (Jia and Reich 2008).

Climate constructs can be defined at different levels of analysis, with different levels of data aggregation; they share the same content, meaning, and construct validity across levels (Chan 1998; James 1982; Ostroff et al. 2003). In this research, similar to Schneider and colleagues' unit-level work in bank branches, we develop the IT service climate instrument at the level of the IT unit, defined as a subunit within the IT department that has a "specific management structure in place, serving a single business client unit" (Nelson and Cooprider 1996). An example would be an IT unit that develops and supports one or more applications for a single business unit. Because one organization may have multiple IT units, performing research at the unit level requires a smaller number of participating organizations when testing the following hypothesis:

> ***Hypothesis***: *The level of service climate within an IT unit will be positively related to the quality of service experienced by its business client unit.*

It is important to note that other factors, such as IT professionals' technical competency, may also impact the quality of IT service experienced by business clients, and thus need to be controlled when testing the above hypothesis. In the following sections, we present results from instrument development and hypothesis testing.

Instrument Development

Following guidelines in the literature (e.g., Churchill 1979; Moore and Benbasat 1991), construct validation was carried out in three stages: (1) item generation, (2) scale development, and (3) instrument testing. The following sections describe these stages in turn.

Stage 1: Item generation

The major tasks in Stage 1 were to generate a pool of candidate items and assess their content validity (Churchill 1979, Cronbach 1971). These tasks were accomplished through literature review, in-depth field interviews, and content reviews by IT academics and practitioners.

Literature review. The literature review conducted to explore dimensions of the IT service climate construct (Jia and Reich 2008) was also used to identify candidate measurement items. The literature review was complemented by field interviews to generate any new items necessary to ensure domain coverage and to establish content validity.

Field interviews. A total of twelve in-depth interviews were conducted with IT professionals from four organizations, representing telecommunication, insurance, banking and media industries. Interview data supported the proposed dimensions (Table 1), but also suggested one adjustment to the Service Leadership dimension. A number of interviewees highlighted the importance of service evaluation (i.e., aligning IT employee recognition and reward with its service outcomes). This variable was originally a component of Service Leadership, but was not initially a separate dimension. Interview data revealed that while aligning IT personnel evaluation with its service outcome is widely viewed as critical, it is often not consistently practiced and is seen as different from the other two types of day-to-day leadership behaviors (i.e., goal setting, work coordination and planning). In addition, in many organizations, while IT managers emphasize the importance of client service, the employee performance evaluation structure may favor technical excellence. In view of these considerations, it was decided that Service Evaluation be developed as a separate IT service climate dimension.

Based on the literature review and field interviews, an initial pool of 65 items was constructed in five ITSC scales: Service Leadership, Service Vision, Client Communication, Client Feedback, and Service Evaluation.

Content validation. Two organizational psychology researchers and four IT practitioners performed content validation. Items that were either too ambiguous (fitting in more than one category), too indeterminate (fitting in no

category), or too redundant (overlaps between items) were revised or eliminated (Moore and Benbasat 1991), resulting in a refined pool of 50 items. The next stage in the instrument validation process was scale development.

Stage 2: Scale development

The goal of this stage was to assess the dimensionality of the various climate scales being developed (Moore and Benbasat 1991). Judges were asked to sort the candidate items into construct categories following Davis (1989) and Moore and Benbasat's (1991) procedures. Three rounds of sorting were carried out, using a pair of new judges in each round. The lengths of these scales through the sorting exercise are summarized in Table 2.

Table 2. The IT Service Climate Scales during Scale Development

Scale	First Sort	Second Sort	Third Sort
Service Leadership	9	7	6
Service Vision	16	10	7
Client Communication	6	8	6
Client Feedback	5	No longer developed	
Service Evaluation	5	5	4
Total	41	30	23

Though the page limit does not permit us to report results from each sort in detail, one adjustment to construct dimensionality during the sorting exercise was noteworthy. As recommended independently by the two judges in the second sort, the Client Communication and Client Feedback scales were combined These two types of IT-client interactions (task-related interactions vs. feedback solicitation) are both in the broad category of communication and are likely to be highly correlated and thus lack discriminant validity. Since Client Communication can be more broadly defined to incorporate client feedback solicitation, it was decided that these two scales be combined for better discriminant validity and parsimony. Results from the subsequent third sort and the pilot study supported this decision.

Also interesting was the result from the third round, which followed Moore and Benbasat's (1991) "blind sort" procedure. While one judge identified four dimensions from the item pool, created labels for them that are consistent with the proposed four dimensions, and also correctly placed all items, the other judge identified three latent dimensions, including a "service orientation" scale with items from the proposed Service Vision and Client Communication scales combined, and reasoned that a service-oriented IT organization will necessarily emphasize communication with clients, thus they should be combined. A decision was made not to combine the two scales at this stage because the decision could be informed by empirical data from the pilot test. High correlations between items from these two scales would support their combination. Another observation of the third sort was that results from both judges supported the earlier decision to not develop Client Feedback as a separate dimension.

The sorting procedure concluded with a 23-item instrument consisting of four scales: Service Leadership, Service Vision, Client Communication, and Service Evaluation. The satisfactory placement of items within these scales provided initial evidence for the construct validity and reliability (Moore and Benbasat 1991). The issue of whether Service Vision and Client Communication should be developed as separate dimensions would be resolved in the next stage with data from the pilot test.

Stage 3: Field test

Pilot test

The pilot questionnaire was administered to systems development employees of an IT organization that also participated in the earlier interviews. Thirty-two useable responses formed the pilot sample. Similar to prior

research on unit-level climates (e.g., Anderson and West 1998; Schneider et al. 1998), the pilot instrument's reliability and construct validity were assessed at the individual level in keeping with traditional approaches to item analysis and scale development. Because the pilot sample was not large enough for an overall exploratory factor analysis (EFA) for the instrument, separate EFA runs were performed for each individual scale as well as each pair of scales (all six possible pairwise combinations) to assess their convergent and discriminant validity.

Items loaded onto one factor in separate EFA runs for each of the four scales, providing initial evidence of scale convergent validity. In pairwise tests, two factors emerged in each run as intended, except for the one involving the Service Vision and Client Communication scales, where all items loaded onto a single factor, suggesting that they tap the same latent construct. The inter-item correlation matrix also indicated that the two sets of items were highly correlated – all Pearson's correlation coefficients were greater than 0.7, and some over 0.8.

Based on the above evidence, items for Client Communication were collapsed into the Service Vision scale, which was also recommended earlier by a third-sort judge.

Additional items were eliminated based on the patterns of inter-item correlations to ensure convergent and discriminant validity of the scales being developed. Throughout the culling process, we ensured that the domain coverage of the construct dimensions would not suffer as a result. The resulting IT service climate instrument from the pilot test consisted of 14 items from three scales: Service Leadership, Service Vision and Service Evaluation (see sample items in Table 3). All three scales achieved composite reliability that is higher than 0.7. The instrument was ready for a final validation.

Table 3. Samples Items from the Pilot-Tested IT Service Climate Scales

Scales	Definitions	Sample Items
Service Leadership	The extent to which IT managers take actions to guide the delivery of service.	My unit manager spends time on planning and coordinating our work and service.
		My unit manager regularly discusses work performance goals with us.
Service Vision	The extent to which meeting client needs, demonstrating flexibility, and establishing communication are emphasized.	My unit often suggests new ways to solve business problems.
		There has been true effort in our unit to establish ourselves as a respected partner of our clients.
		My unit frequently shares information with clients.
		My unit actively solicits comments and feedback from clients.
Service Evaluation	The extent to which the evaluation of IT professionals is linked with service performance.	Our compensation is linked to client evaluations of our service performance.
		Customer service is an important criterion of our formal performance evaluation.

As the IT service climate instrument was pilot tested, so was the following measure for the control variable of technical competency. It achieved a composite reliability (ρ_c) greater than 0.8. The two items measured were:

1. People in my unit have the necessary technical skills to do our work.
2. People in my unit are more technically competent than most units in which I have worked.

Final instrument test

Two insurance companies, a government agency, and a manufacturing company participated in the final phase of the study and provided data for instrument validation and hypothesis testing. Organization charts were obtained from each organization to identify matched IT and client units. All participating IT units are systems development units, responsible for applications development, enhancement and maintenance needs of their partner client units, which come from various functional areas, such as finance and human resources.

Two surveys were administered with the participating companies. The IT survey, consisting of the pilot-tested IT service climate scales, sought to include as many employees in the participating IT units as possible, while the client survey, consisting of the IT-SERVQUAL instrument (Pitt et al. 1995), was distributed to five or six members of each client unit who frequently interact with the respective IT unit. Copies of the two surveys were made, each including a unique identifier. The contact persons distributed questionnaires, collected completed questionnaires, and returned them to the researchers.

Survey Respondents

A total of 247 useable responses to the IT survey and a total of 124 useable responses to the client survey were returned from the participating organizations (Table 4). Due to unanticipated issues at the time of survey administration, the manufacturing company did not participate in the client survey, and its employees from only one systems unit were available for the IT survey.

Table 4: Participating organizations in the Final Data Collection

Company	IT Systems Employees	IT Survey Responses	Client Survey Responses
Government Agency	130	51	22
Insurance Company A	200	98	42
Insurance Company B	140	87	60
Manufacturer	56	11	-
	TOTAL:	247	124

Based on the unique identifier on each questionnaire, which indicated from which IT or client unit it was returned, 39 matched pairs of IT-client units were identified, with at least three responses from an IT unit and at least two responses from each client unit. These 39 matched pairs include 195 IT responses and 121 client responses (Table 5), and the remaining 52 IT responses and three client responses came from unmatched units. The average number of responses is 5.0 per IT unit and 3.1 per client unit.

Table 5: IT and Client Units in the Criterion Validity/Hypothesis Test

Company	IT-Client Paired Units	Responses from IT Units	Responses from Client Units
Government Agency	6	36	22
Insurance Company A	14	86	40
Insurance Company B	19	73	59
TOTAL:	39	195	121

The 247 IT responses formed the sample for confirmatory factor analysis (CFA) of the ITSC instrument, and data from the 39 matched-pairs of IT and client units were used in the criterion validity/hypothesis test. The CFA results are discussed next.

Confirmatory factor analysis

Because neither LISREL nor PLS-Graph can directly factor-analyze a multidimensional formative construct like IT service climate (Gefen et al. 2000), we followed Yi and Davis' (2003) approach to leave out the second-order latent variable and directly evaluate the factorial validity of a decomposed model of three IT service climate dimensions (Figure 1d). Since this decomposed model only contains first-order reflective constructs, it can be assessed by either LISREL or PLS-Graph. LISREL was chosen in this study.

Goodness-of-fit tests of alternative models

LISREL 8.80 was used to evaluate the goodness-of-fit of the three alternative models (Models 1-3 in Figure 1a,b,c) in relation to the hypothesized (decomposed) three-factor IT service climate model (Model 4 in Figure 1d).

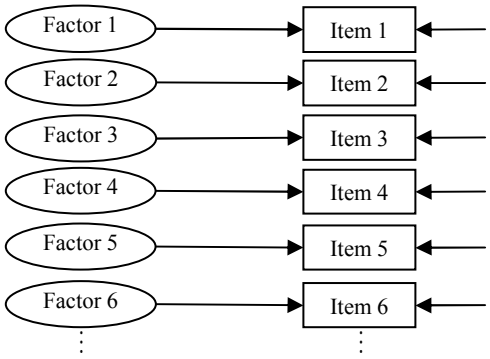

Figure 1(a) Model 1: Null

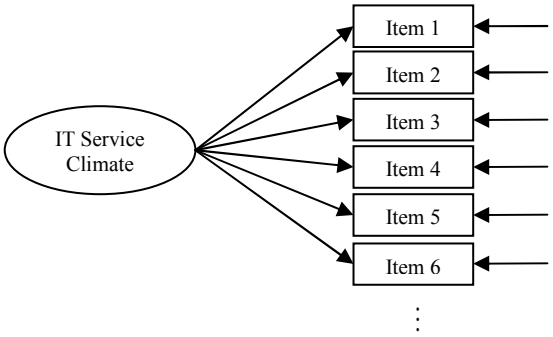

Figure 1(b) Model 2: One first-order factor

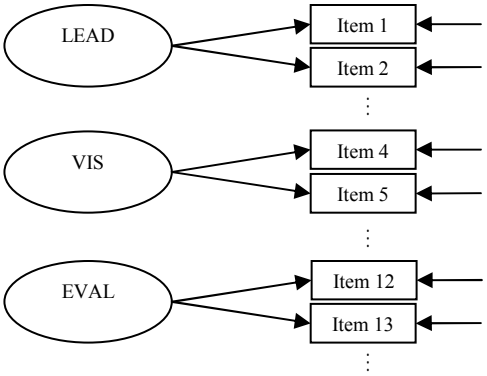

Figure 1(c) Model 3: Uncorrelated three factors

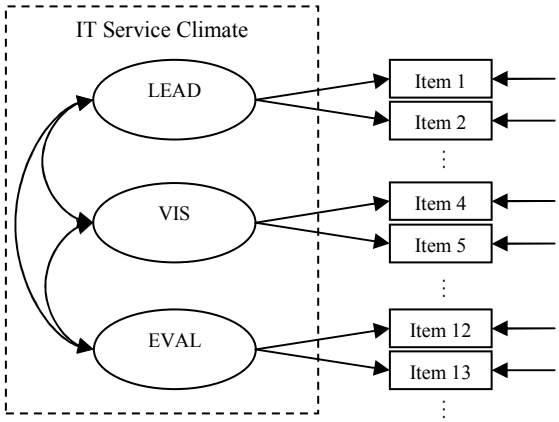

Figure 1(d) Model 4: Correlated three factors

As shown in Table 6, the first three models have poor fit when comparing their fit indices against the recommended thresholds. Only the hypothesized decomposed model (Model 4 in Figure 1d) demonstrated satisfactory fit against all thresholds. Figure 2 shows the estimates of all parameters in this model. Based on the above test of alternative models, it is concluded that the hypothesized model best represents the IT service climate construct.

Table 6. Goodness-of-fit Tests of Alternative Models (*n* = 247)

Criteria	Threshold	Model 1 Null	Model 2 One first-order factor	Model 3 Three uncorrelated first-order factors	Model 4 Three correlated first-order factors
χ^2		1339.42	365.34	307.69	151.62
d.f.		77	77	77	74
χ^2/d.f.	(< 2.50)	17.40	4.74	4.00	2.05
RMSEA	(< 0.08)	0.258	0.123	0.110	0.065
CFI	(> 0.90)	0.00	0.93	0.91	0.97
NFI	(> 0.90)	0.00	0.90	0.89	0.95
GFI	(> 0.90)	0.36	0.82	0.85	0.92
AGFI	(> 0.80)	0.13	0.76	0.79	0.89

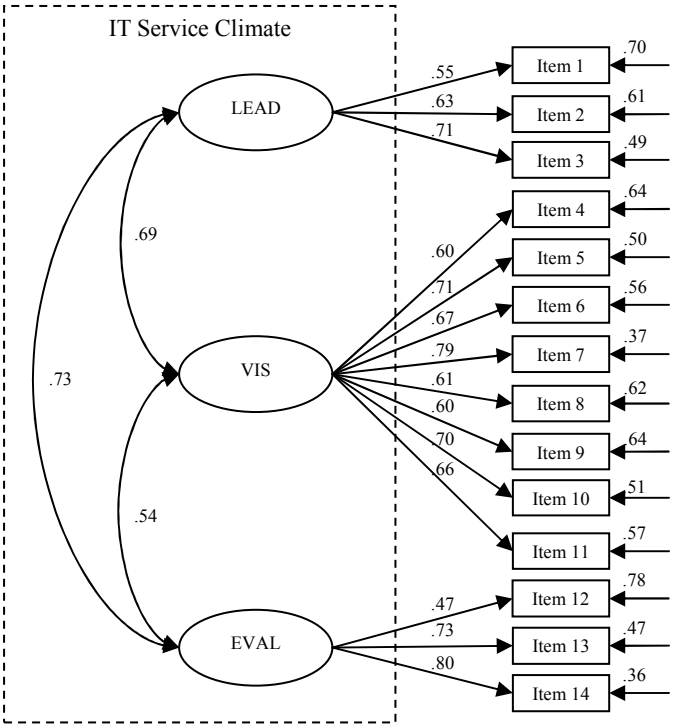

Figure 2. Parameter Estimates (Model 4, n = 247)

Convergent validity/unidimensionality

To demonstrate convergent validity and unidimensionality, one single latent variable must underlie each of the three IT service climate scales (Anderson and Gerbing 1988). A separate LISREL run was conducted for each of the construct dimensions. Results in Table 7 indicate that all three scales show good model fit, thus demonstrating satisfactory unidimensionality and convergent validity.

Table 7. Unidimensionality/Convergent Validity (n = 247)

Factor	Number of indicators	χ^2	d.f.	χ^2/d.f.	RMSEA	CFI	NFI	GFI	AGFI
LEAD*	3	15.67	8	1.96	0.062	0.98	0.97	0.98	0.95
VIS	8	33.48	20	1.67	0.052	0.99	0.98	0.97	0.94
EVAL*	3	15.67	8	1.96	0.062	0.98	0.97	0.98	0.95
Threshold				< 2.50	< .08	> .90	> .90	> .90	> .80

Note: * This model is saturated because of the number of indicators. Fit indices are thus not available. Fit indices presented here were calculated from a two-factor model including LEAD and EVAL.

Discriminant validity

To demonstrate discriminant validity, the three service climate scales must be unique from one another (Gefen et al. 2000). Pairwise LISREL models were tested, where each model was run twice, one with the two latent constructs allowed to freely covary (Table 8 – unconstrained model), and the other with their covariance constrained to one (Table 8 – constrained model). Results show that the unconstrained models represent better fit in all χ^2 tests, thus establishing discriminant validity for the three scales.

Table 8. Discriminant Validity of the Three First-Order Factors (n = 247)			
Construct Pair	Constrained Model χ^2 (d.f.)	Unconstrained Model χ^2 (d.f.)	$\Delta\chi^2$
VIS-LEAD	108.02 (44)	68.94 (43)	39.08**
VIS-EVAL	145.92 (44)	89.85 (43)	56.07**
LEAD-EVAL	63.36 (9)	15.67 (8)	47.69**
** $p < 0.01$			

Internal consistency reliability

A composite reliability value (ρ_c) greater than 0.5 indicates that variance captured by the measure is greater than the error components, and therefore suggests satisfactory levels of reliability (Bagozzi 1981). Thus, the overall IT service climate instrument, as well as its three scales, demonstrated satisfactory reliability (Table 9).

Table 9. Composite Reliability ρ_c (n = 247)		
Factor	Number of indicators	ρ_c
IT Service Climate (overall)	14	0.90
LEAD	3	0.71
VIS	8	0.87
EVAL	3	0.69
$\rho_c = (\sum\lambda_i)^2$ Variance (A) / $((\sum\lambda_i)^2$ Variance $(A) + \sum\theta_\delta)$.		

To summarize, the IT service climate instrument has shown satisfactory internal consistency reliability, convergent validity/unidimensionality and discriminant validity. In the following section, we assess its criterion validity and the extent to which it can explain variance in IT service quality.

Criterion Validity/Hypothesis Test

The criterion validity/hypothesis test was conducted using hierarchical regression with data from the 39 matched pairs of IT and client units. Hierarchical regression was chosen to examine the explanatory power of IT service climate because it can parcel out the effects of other variables on the criterion variable (i.e., IT service quality).

Before this unit-level relationship could be assessed, the multi-item within-group agreement statistic, $r_{WG(J)}$ (James 1982), was calculated as evidence to justify aggregation of individual-level service climate perceptions to the unit level. The statistics for all 39 IT units' service climate and technical competency scores were well over the 0.60 cutoff (James 1982). The statistic for IT service quality ratings from the 39 client units was also a satisfactory 0.76, with only two units below 0.60. Therefore, there was adequate justification for aggregating data to the unit level for the regression analysis described next.

A hierarchical regression equation was estimated with the following variables entered in turn: company, technical competency, and IT service climate. Regression results show that,

a) controlling for the organization, technical competency explained 12.7% of the variance in the IT unit's service quality,
b) controlling for both the organization and technical competency, IT service climate explained an additional 33.9% of the variance in IT service quality, and
c) the overall regression equation explained approximately 71% of variance in IT service quality.

It was thus concluded that the IT service climate construct possesses satisfactory explanatory power and demonstrates criterion validity. The hypothesis that IT service climate is positively related to IT service quality has been supported.

Summary and Contributions

Recent research has built upon organizational climate theories to propose a new construct, IT service climate, as an antecedent of IT service quality (Jia and Reich 2008). This study has developed and tested measures for the new construct and examined the strength of the relationship between it and the level of service quality experienced by business clients.

Following customary instrument development procedures, a three-factor, 14-item measurement model of the IT service climate construct has been validated with data from 247 systems employees from four participating organizations. Consisting of three dimensions, including Service Leadership, Service Vision, and Service Evaluation, the instrument has demonstrated satisfactory reliability, convergent validity/unidimensionality, and discriminant validity. In addition, in 39 matched IT and client units, service climate scores from IT units explained approximately 34% of the variance in IT service quality as rated by their respective client units, thus demonstrating satisfactory criterion validity.

Limitations

This research is not without limitations. The final instrument test was conducted with a convenience sample, consisting of two insurance companies, a government agency and a manufacturer. This industry coverage is limited. The sample size did not allow meaningful comparisons of results across organizations. Because all participating IT employees were from systems units, future research needs to test the instrument in other service settings, such as helpdesk and network. Though the sample for the criterion validity/hypothesis test (39 matched pairs of IT-client units) was statistically sufficient for regression analysis, it is admittedly small. In sum, as with other construct validation studies, the instrument needs further testing using new samples from different organizational and IT service settings to ensure its stability and robustness.

Contributions

This research makes a number of contributions to IT research and practice. With a focus on the service provider side of the IT-client relationship, it provides a tool to look inside the IT function at the very practices and behaviors related to providing IT service to business users. This new construct offers a theory-based extension to the existing IS-SERVQUAL research and opens up a new area of inquiry. It is also hoped that this measurement instrument will pave the way for further exploration of the potential applications of the climate construct to other IT phenomena.

This research is also relevant to practice. The IT service climate scales can assist IT managers in identifying the aspects of service climate that most strongly relate to service quality in their organization. Using this data, they can develop appropriate organizational interventions. This preliminary test of the association between IT Service Climate and Service Quality suggests that managers who work to improve their service climate can expect a significant positive impact on client evaluations of their service quality.

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