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Full Length Research Paper

Measuring business-to-business customer service: A structural re-examination of the INDSERV scale

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Theory and empirical evidence suggest that the dimensions of business-to-business customer service differ to individual service. In response, Gounaris (2005a; b) developed the INDSERV business-to-business customer service scale, the sub-scales of which are potential quality, hard process quality, soft process quality and outcome quality. INDSERV seems to be a valid and superior scale for business-to-business settings. However, Gounaris treats the four internal dimensions as indicators of a single latent "B2B service" factor. This paper argues that researchers should model the INDSERV dimensions as a process, rather with potential quality being an antecedent of hard and soft process quality, and all three being antecedents of outcome quality. This argument is tested through structural equation tests both of original Gounaris (2005c) covariances and a new dataset from 170 supply dyads in South Africa. The results generally support the alternate conception of business-to-business customer service. Modelling customer service in this way allows more complex and interesting model generation. Allowing direct relationships between the indicators of INDSERV, and differential relationships of these with other variables, allows for broader hypothesis development and therefore greater expansion of the theory. Various implications arise for marketing and other practices and researches.

Key words: Business-to-business customer service, B2B, INDSERV, structural equation modelling, South Africa.

INTRODUCTION

In the conception and measurement of service quality, the development of separate scales for business-to-business (B2B) contexts has been a necessary and important advancement. This realisation came about as a research has increasingly found that the dominant Parasuraman et al. (1988, 1991, 1994) service quality (SERVQUAL) scale which was developed for consumer-level service has shortcomings in certain areas (Ladhari, 2008).

Researchers have frequently questioned and revised the dimensionality of SERVQUAL, with variegated numbers and identities of factors emerging in different studies. A particular finding is that context appears to play an important role, including both geographical and industry context. Researchers have accordingly developed several more context-specific customer service scales. Perhaps the most fundamental split between contexts is that between consumer-based and B2B service perceptions (Westbrook and Peterson, 1998). B2B service relationships are of a longer-term and greater-intensity nature. This implies service factors different to those pertinent to individual consumers. For example, longer-term financial invoicing and payment systems are greater issues in B2B service. Evidence has shown that SERVQUAL appears to perform less admirably than B2B contexts (Babakus and Boller, 1992; Durvasula et al., 1999). Accordingly, researchers have made some recent attempts to investigate and develop alternative B2B-specific scales. Westbrook and Peterson (1998) undertook an exploratory research to suggest new sub-scales, based upon which Vandaele and Gemmel (2004) tested a 'B2B SERVQUAL'. However, this attempt, although showing some validity, contradicted many of the anticipated dimensions, and has not been subsequently pursued. Further, Woo and Ennew (2005) successfully proposed and tested a 6-dimension B2B professional service scale.

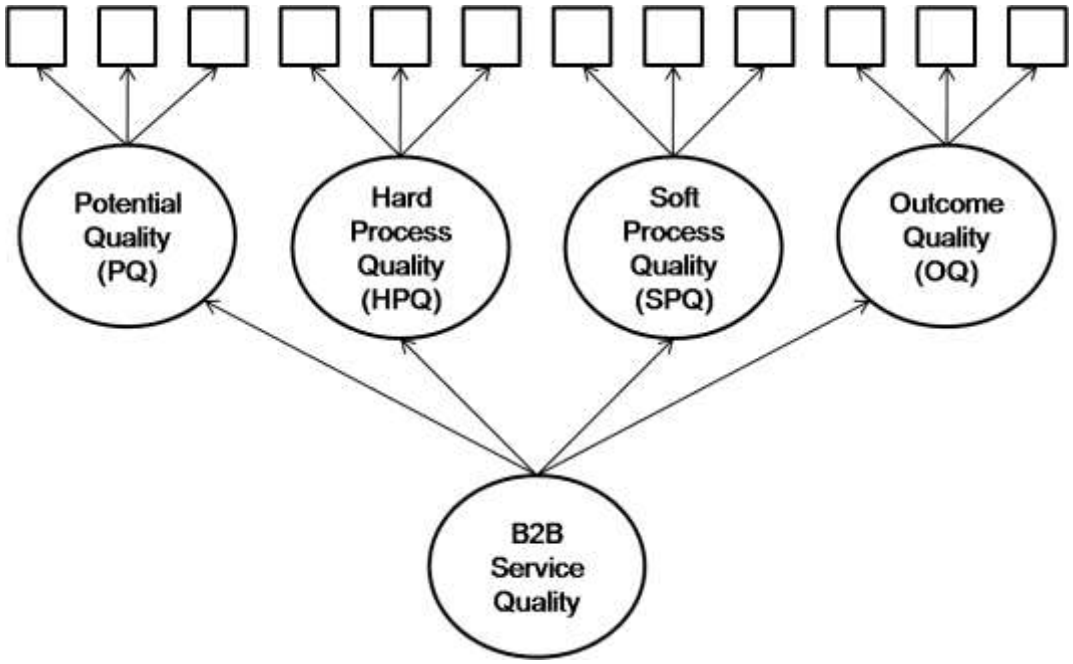

Figure 1. Gounaris (2005a, b) 2nd-order latent model.

Nonetheless, their model is not broad enough to extend to all B2B settings, notably the industrial setting, and so it remains largely unsubstantiated. Perhaps, the most important contribution to this area has been the INDSERV scale proposed and developed by Gounaris (Gounaris, 2005a, b, c; Gounaris and Venetis, 2002). Extending the dimensions suggested by Szmigin (1993) and Bochove (1994), Gounaris proposed that B2B service quality should be composed of, at least, four dimensions:

(1) Potential quality (PQ): It evaluates a priori elements that must be in place in order for the supplier to provide services adequately to the customer, such as adequate staffing, facilities and management philosophy. This dimension might be said to contain a priori inputs in the service process.
(2) Hard process quality (HPQ): It refers to the objective and task-oriented issues within B2B supply, such as staying within budget and deadlines, therefore expressing the process of delivering the actual service and associated quality judgements.
(3) Soft process quality (SPQ): It refers to issues within the B2B relationship which are oriented on people, communication and relational quality, such as listening to the client with enthusiasm and pleasantness.
(4) Output quality (OQ): Essentially, it is the ultimate dependent variable in B2B service, referring to the relative impact of the supplier's services on issues such as the customer's profitability, strategy and ability to operate. Validity tests have established OQ as a single sub-factor.

The INDSERV instrument is the only scale that has shown superior initial psychometric properties to SERVQUAL in its intended B2B settings (Gounaris 2005a, b; Ladhari, 2008), and it has been used successfully as both antecedent (Gounaris and Venetis, 2002; Gounaris, 2005c) and dependent variables (Lee, 2010). Gounaris (2005a, b, c) primarily asserts that INDSERV should be treated as a hierarchical second-order factor model, although it generally does not always treat it as such in practice. The resultant, overall "service quality" factor, with PQ, HPQ, SPQ and OQ factors as first-order latent indicators, is then used as a single variable in a structural model (Gounaris and Venetis, 2002; Gounaris, 2005c). Figure 1 shows this specification.

PROPOSED STRUCTURAL SPECIFICATION OF INDSERV DIMENSIONS

This article argues that the treatment of the internal structure of INDSERV is open to some debate, especially that B2B research may benefit from treating the internal dimensions of INDSERV as differential variables within the nomological structural net, with direct relationships between them, rather than as indicators of a single factor. Figure 2 shows a just identified version of this sort of specification, in terms of which there is a systemic, non-recursive structural flow between the aspects of INDSERV.

There are two arguments underlying this alternative

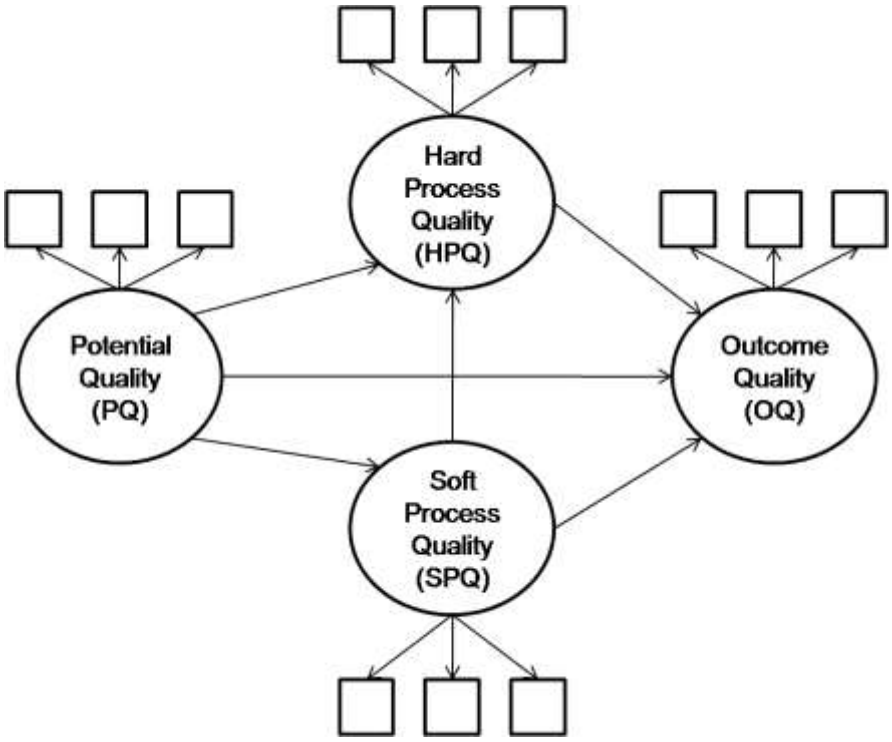

Figure 2. Internal structural model.

specification:

(a) Face definitions of INDSERV suggest that the dimensions may operate at different places and times in the overall B2B service process. Specifically, through a system's lens, service is seen to have inputs [which is clearly what Gounaris operationalises as the potential quality (PQ) dimension], leading to active service processes (hard and soft process quality, 'HPQ'/'SPQ') which in themselves may interact, leading in conjunction with PQ to perceptions of quality of service outcomes [outcome quality (OQ)]. In Gounaris' implicit conceptualisation, OQ is, therefore, the ultimate dependent variable that is variously impacted upon by the three other facets of the service. PQ primarily impacts on OQ through the mediating process impacts of HPQ or SPQ, and affect OQ directly, thereby expressing effects not captured in the other two process elements (for example, where customers have expectations of improved outcomes premised on PQ, but have not yet had time to evaluate process quality).

(b) In more fundamental construct validity terms, the reduction of a multi-item scale of this type to a single second-order factor substantially reduces the potential usefulness of the construct as antecedent or dependent variable(s) in structural modelling, that is, within the nomological net (Bagozzi, 1980; Venkatraman, 1989). If the different dimensions of INDSERV act as different points in a system, then they may have variegated effects on other variables or vice versa. In short, the internal structure that is tested and proposed in this model potentially tells a better story for many research questions. For instance, an antecedent such as the turnover of service employees might have differential impacts on PQ and SPQ, and the researcher may wish to hypothesize that it affects HPQ and OQ through these mediators. This is only possible by including the dimensions separately in a structural model rather than as indicators. This assertion does not necessarily denigrate the second-order model of Gounaris. It is possible to test whether a combination of the second-order latent variable and internal path structure applies. Figure 3 shows such a specification, in terms of which the dimensions of INDSERV are allowed to interact directly as well as being related via a common factor.

In addition to the systems concept of inputs→processes→outcomes, inter-process effects may also occur. Specifically, SPQ may affect HPQ positively and directly. This is premised on the basis of social exchange theory (Blau, 1964), which in a general sense suggests that norms of reciprocity and fair exchange arise in groups or relationships which drive not only the 'hard process' terms of exchange itself, but also can create prosocial behaviours that exceed the exchange terms (George and Bettenhausen, 1990). Relational SPQ exchanges provide the context for affective spillover, such as emotional contagion, where customers react to and potentially mirror the affective states of supplier

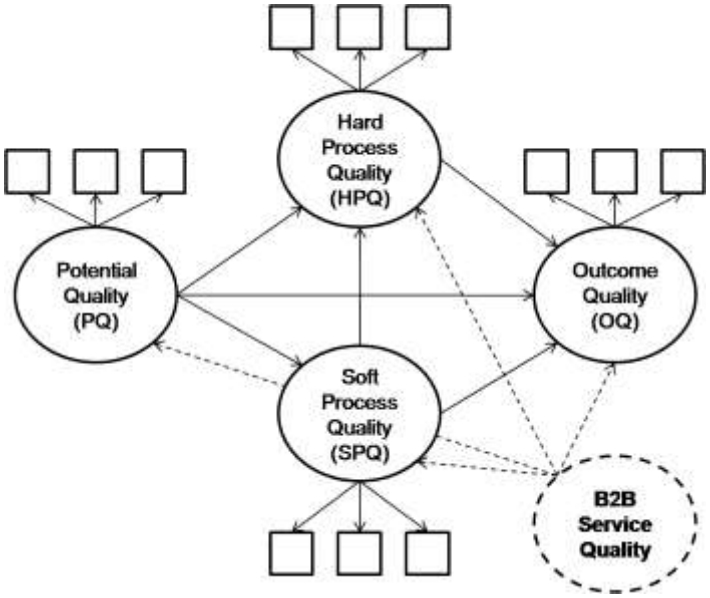

Figure 3. Internal structure and 2nd-order latent model.

effect, which in turn may have a halo effect on perceptions of hard processes (Pugh, 2001; Tsai and Huang, 2002). The following hypotheses (none of which Gounaris took into account) follow thus:

H_1: There are direct positive relationships between (a) PQ and OQ, (b) HPQ and OQ and (c) SPQ and OQ.
H_2: There are direct positive relationships between (a) PQ and HPQ and (b) PQ and SPQ.
H_3: The relationship between PQ and OQ is partially mediated by (a) HPQ and (b) SPQ.
H_4: There is a direct path between SPQ and HPQ.

The paper therefore compares the Gounaris (2005a, b, c) measurement model with structural models allowing paths between the INDSERV dimensions. In the initial tests of these hypotheses, using these data, Lee (2009) found evidence favouring the use of an internal structure to INDSERV. However, those preliminary findings had two weaknesses: they were prone to same-method bias (measures were collected from the same sources in the same surveys) and they did not account for other feasible covariates. The restriction to INDSERV-only variables is problematic as it both potentially causes specification error (correlations are insufficiently representative of true relationships in the greater context) and renders structural equation tests with the internal structure just-identified or with very low degrees of freedom. In the current study, both bias and covariates methods are accounted for.

RESEARCH METHODS

The study utilizes two datasets to compare the latent conception of Gounaris (2005a, b, c) and the alternative internal-structure relationship posited here.

Outline of Studies 1 and 2 methods

Study 1 uses the original Gounaris (2005c) covariance matrix as a data input, Gounaris (2005a, b) did not present covariances. Gounaris (2005c) studied the role of B2B service quality as one of the antecedents of customer trust, commitment and ultimate retention. The original second-order latent variable model was compared to an internal relation path model using these covariances. Gounaris (2005c) describes the method, “space does not permit a repetition of this except to repeat that this sample comprised 127 managers of consultancy companies’ customers”. Study 2 employs an original dataset, consisting of self-report surveys of managers in South African customer firms who are directly involved in the management or operation of a crucial B2B supply relationship. Since this study is new, a detailed explanation will be done on it as the study progresses.

Details of Study 2

Study 2 utilizes a sampling frame of 420 organizations from the Gauteng area in South Africa, which is the continent’s most economically advanced and internationally connected financial centre. About 170 usable responses were returned for which managers had usable knowledge of the frontline B2B supplier services. The final response rate is therefore 40%. The customer-supplier firms interact on average, 163 times a year (median = 96), with high variability of 170 (interquartile range = 48 to 240). A median of 5 vendor employees work directly on the customer's account (interquartile range = 4 to 12). Average size of supplier firms was estimated to be 1108 employees (median = 60), with SD and interquartile range of 3397 and 30 to 200, respectively. Customer managers estimated the size of their own workforces at an average of 8427 (median = 30, SD = 79 to 192; interquartile range = 9 to 292). Skew in size estimates is due to some very large corporations in the sample. Industries are broadly services (59.19%), retail or

wholesale (25.59%) and manufacturing, utilities, building and transport (23.21%). However, 29.09% of the customer firms offer services as their main business.

In study 2, managers reported on the INDSERV scale items of Gounaris (2005c), based on a key supply relationship. Potential quality ("PQ") had α = 0.70, and its sample item includes "the supplier has all the facilities needed to meet the needs of his customers". Hard process quality ("HPQ") had α = 0.79, and its sample item is "the supplier keeps to agreed time schedules". Soft process quality ("SPQ") had α = 0.78, and its sample items are "the supplier listens to the problems of his customers" and "the supplier is open to the suggestions / ideas of his customers about his service or product". Output quality ("OQ") had α = 0.78, and its sample item is "the supplier has a notable, good effect on the business of his customers". In addition, covariates accounted for two categories. First, the assumed control variables, which include industry, type of service provided, turnover of staff and personal frequency with which respondents interact with the B2B supply chain were partialled out in the covariance matrix that is then entered into the analysis. Secondly, covariates assumed to have a direct role in modelling relationship, including customer-supplier frequency of interaction ("Frequency"), integration of the customer into the supply chain ("Integration") and the sizes of both companies were included.

Accounting for same-method bias

The study follows the procedures suggested by Podsakoff et al. (2003) for same-method bias. Some sources of same-source bias in both studies may have been ameliorated through survey design and implementation (for example, good question design and guaranteeing confidentiality). Statistical adjustments are also possible and should be used where possible. Notably, two assessments and adjustments are possible in the absence of multiple construct measures. First, the classic single-factor test assesses the extent to which variables are loaded on one factor. Rejection of this at least implies multiple factors (instead of an overwhelming effect from same-method sources), but does not say much more. A more complex method is the unmeasured latent factor approach, which models all manifest variables partly as indicators of a single latent factor that the study assumes to indicate and extract same-source bias. The research employs this approach where possible.

RESULTS

Structural equation modelling (SEM) is the primary methodology for evaluating the alternative models. Table 1 gives the covariance matrices of Studies 1 (Gounaris, 2005c) and 2.

Models based on data from Gounaris (2005c)

Table 2 compares two SEM models based on the covariances provided by Gounaris (2005c), who only models covariances between aggregated INDSERV dimensions, so only the first order models are possible (second order models require separated multiple indicators). However, his high coefficient alphas suggest that little is lost compared to a second-order model. In Table 2, model 1 shows fit statistics for the first-order latent model that is the simpler latent variation of his original specification, and Model 2 shows fit for a model with an adapted internal path specification.

The comparison of Models 1 and 2 in Table 2 suggests that the internal-path model as suggested in this paper is superior to the simple latent model specification suggested by Gounaris (2005c).

The inclusion of internal structural pathways between the dimensions of INDSERV, which creates a model with the improved and non-significant chi-square statistics, have lower RMSEA statistics that are within the ranges considered acceptable (whereas in the latent model they are not), higher and acceptable in CFI and NNFI/TLI indices, lower in SRMSR and with lower information criteria in all cases.

Models based on Study 2 data

Study 2's primary dataset allows for all model variants and attempts at the second-order latent variable models in producing solutions with Heywood cases, despite many variations. Accordingly, path modelling and first-order solutions are retained. Model 3 in Table 3 shows the latent variable model without an internal structure in INDSERV dimensions. Model 3 has a significant Chi-square statistic, a higher RMSEA than optimal, high SRMSR of 0.12, and a lower NNFI than the often-used cut-off range of 0.90 to 0.95 or above. Models 4 to 5 show evidence for internal path models. Model 4 has internal paths without any latent variable modelling (that is, path analysis between INDSERV dimensions). Model 5 has INDSERV dimensions as indicators of a first-order latent service variable (Figure 2), as well as internal paths. As seen in Table 3, Model 4 has good fit in many respects (although the 90% confidence interval is wider than preferred), albeit with the disadvantage of no latent variable modelling. Model 5 can be compared to Model 3 in terms of structural paths, and has good fit in all respects, including a non-significant chi-square. Model 5 seems superior to Models 3 and 4, although Model 3 does have the lowest and superior CAIC. AIC and SBC are lowest for Model 5, and its other indices are superior.

To compare the Gounaris (2005c) model and the study 2 models, Figure 4 gives partially comparable path coefficients for covariates as well as a common method factor. Most standardized paths are of comparable size, with the exception of the HPQ→OQ path, which for the Gounaris (2005c) data is so small as to be insignificant. As expected by Hypotheses 1 to 4, the results suggest substantial inter-dimension effects for the INDSERV variables, and thus support the hypothesized structure.

DISCUSSION

This study proposed to assess whether the addition of structural paths to the INDSERV measurement structure leads to acceptable models. Evidence presented here

Table 1. Correlations, means and standard deviations for the two studies.

Statistic	Study 1		Study 2		Correlations[a]									
	M	SD	M	SD	1	2	3	4	5	6	7	8	9	10
1. SPQ	5.42	0.99	3.78	0.65	1	0.73	0.61	0.72	-0.03	-0.06	0.09	0.38	-	-
2. HPQ	5.47	0.88	3.79	0.78	0.71	1	0.73	0.70	-0.05	-0.02	0.01	0.28	-	-
3. PQ	5.07	0.74	3.83	0.73	0.39	0.48	1	0.65	0.04	-0.05	-0.07	0.23	-	-
4. OQ	4.79	0.88	3.87	0.67	0.66	0.52	0.46	1	-0.01	-0.12	0.00	0.37	-	-
5. Covariate 1	4.81	0.91	4.50	1.23	0.46	0.41	0.34	0.46	1	0.14	-0.08	0.04	-	-
6. Covariate 2	5.27	1.10	2.31	1.22	0.54	0.38	0.17	0.50	0.76	1	0.37	0.19	-	-
7. Covariate 3	4.67	1.04	1.70	1.05	0.60	0.45	0.16	0.60	0.36	0.61	1	0.23	-	-
8. Covariate 4	3.00	1.25	4.86	0.93	0.19	0.20	0.18	0.01	0.17	0.16	0.14	1	-	-
9. Covariate 5	3.30	0.56	-	-	0.39	0.35	0.16	0.48	0.51	0.55	0.57	0.15	1	-
10. Covariate 6	3.39	0.72	-	-	0.09	0.21	0.05	0.23	0.18	0.14	0.24	0.35	0.42	1
11. Covariate 7	4.50	1.01	-	-	0.54	0.33	0.12	0.57	0.54	0.67	0.64	0.06	0.55	0.32

[a]Correlations from Study 1 (Gounaris, 2005c) are below the diagonal, while correlations from Study 2 are above the diagonal. For Study 1, covariates are: 1 = intent of the customer to invest, 2 = Intent of the customer to stay, 3 = Affective commitment, 4 = Calculative commitment, 5 = Social bonding, 6 = Structural bonding and 7 = Trust. For Study 2, covariates are: 1 = Customer-supplier frequency, 2 = Size of customer firm, 3 = Size of supplier and 4 = Integration of the customer into the supply chain.

Table 2. Comparative model fits for alternative models based on Gounaris (2005c) data.

Statistic	Model 1 (1st-order latent[a])	Model 2 (Internal paths)
Chi-square (χ^2)	79.89 (23)[†]	35.92 (19)**
SRMSR	0.06	0.04
RMSEA	0.14	0.08
RMSEA 90% CI	0.11 - 0.17	0.04 - 0.12
AIC	33.89	-2.08
CAIC	-54.53	-75.12
SBC	-31.53	-56.12
CFI	0.92	0.98
NNFI/TLI	0.81	0.93

[†] = $p < 0.01$, ** = $p < 0.05$. [a]1st-order latent refers to the overall service quality as latent and manifest and the aggregate INDSERV dimensions as indicators.

here appears to support this specification. The advantage of this specification is that it allows for a greater understanding of the process of service, in other words, it allows researchers to explore how service happens as opposed to only what affects or is affected by the service. By allowing direct relationships between the indicators of INDSERV, the differential relationships of these with other variables allow broader hypothesis development and therefore greater expansion of the nomological net (Bagozzi, 1980).

Lee (2010) gives an example of the differential

Table 3. Comparative model fits for alternative models based on Study 2.

Statistic	Model 3: 1st-order latent model without internal paths (covariates covary with LV)	Models including INDSERV internal paths	
		Model 4: Path analysis only	Model 5: 1st-order model (covariates load on LV)
Chi-square (χ^2)	46.67 (13)†	15.04 (7)**	7.35 (6)ns
SRMSR	0.12	0.04	0.03
RMSEA	0.12	0.08	0.04
RMSEA 90% CI	0.09 - 0.16	0.02 - 0.14	0.00 - 0.11
AIC	2.67	1.04	-4.65
CAIC	-33.09	-27.91	-29.47
SBC	-2.09	-2.91	-23.47
CFI	0.93	0.98	0.99
NNFI/TLI	0.85	0.93	0.99

† = $p < 0.01$. [a] 1st-order latent here refers to the overall service quality as latent and manifest, and the aggregate INDSERV dimensions as indicators. 2nd-order latent here refers to the overall service quality as second-order latent, the INDSERV dimensions as 1st-order latent, and the individual measures of INDSERV as manifest indicators.

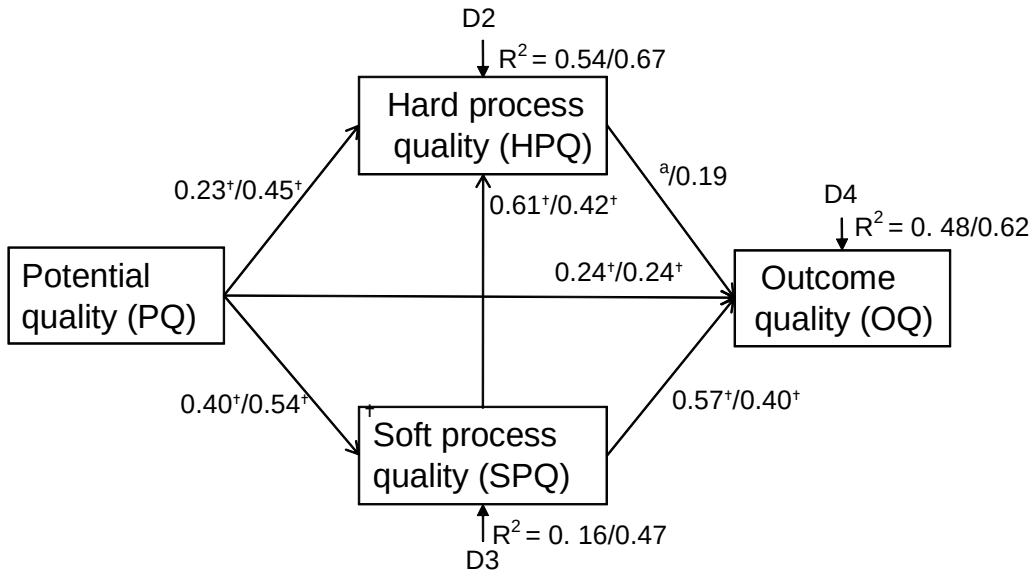

Figure 4. Path comparisons of models based on Gounaris (2005c) and Study 2 data. † = $p < .01$. All coefficients are standardized. Gounaris (2005c) coefficients are before slash, while Study 2 coefficients are after slash. [a]For Gounaris (2005c) model, this coefficient is very close to zero with a large residual, and is therefore removed to enable over-identification.

treatment of INDSERV within hypothesis development. The author uses INDSERV as a set of dependent variables in a structural equation model, with internal relationships of the type shown in Figure 2. The analysis finds that quality of employee movement in the supplier has differential impacts on this dependent INDSERV system. 'Employee movement' affects OQ not directly, but through hypothesized and complex mediation relationships, primarily through PQ and SPQ. Various implications arise for marketing and other practice and research. Dependent on localized confirmation of the structure, researchers should utilize INDSERV (and, in fact, similar multi-dimensional service scales) as a process system that can be impacted differentially at various points. Therefore, different areas of management and marketing literature should be applied to the various 'points' and internal paths of service generation proposed here (for example, the social bonding and emotional contagion literatures used in this paper to hypothesize the SPQ→HPQ link). These various research areas can be used to generate complex systems of research propositions that thoroughly explore the generation and

impact of B2B service quality. For managers and service consultants, combined structural and causal modelling, by potentially combining Bayesian and structural equation models (Gupta and Kim, 2008), would potentially allow for creation of monitoring and evaluation systems that have multiple criteria and advanced decision possibilities. An example of the latter is a 'dashboard' evaluation system based on causal and structural modelling that allows managers to allocate resources across the system to B2B service aspects based on relative changes in customers' feedback on all of the potential quality, hard and soft processes and outcome quality.

LIMITATIONS

There are several research limitations. The analysis assumes that the Gounaris (2005c) covariance matrix is robust, based on their own use of structural equation modelling. As discussed, Gounaris (2005c) did not model fully the second-order latent relationships, instead he used the aggregated manifest measures of the INDSERV dimensions. Doing so may alter the relationships, yet the measurement error would appear low as discussed. The current study 2 covariances do not produce a workable second-order factor model, even if a two-stage least squares model may enable this. Although the use of a ubiquitous latent variable adjusts somewhat for common method bias, this adjustment cannot pick up all method bias. The cross-sectional nature of the data did not allow for time-separated effects between the INDSERV elements; however, the methods involved convenience sampling with all its attendant drawbacks (including possible self-selection, retrospective recall, primacy and recency). Self-report surveys have limited interaction between the interviewee and the interviewer. In addition, this research largely covers the formal business sector, and is therefore possibly less applicable to the smaller and informal business sectors.

FURTHER RESEARCH

A great amount of research is necessary to place the INDSERV process posited here in a greater nomological net, placing these INDESERV dimensions as differential antecedents or dependent variables in a wide variety of marketing and management models. In addition, longitudinal models would help to investigate the possibility of feedback loops better. Extension of the scale and dimensions to specific sectors of B2B service, such as professional services, logistics chains, service within manufacturing supply, and so on, is also necessary. Finally, researchers might assess dyadic models, perhaps utilizing differences on INDSERV dimension scores between suppliers and customers, and by extension using difference score regressions and response surface design analysis (Edwards, 2002).

Conclusions

The accurate and useful measurement and explanation of B2B customer service is important. B2B contracts are often exceptionally large and long-term in nature. Disruptions to such relationships can be crucial, and improvements can generate high value for suppliers. INDSERV is a promising advance in measuring customer service, but its treatment so far as a single (albeit complexly derived) construct is perhaps less useful in diagnosis and advanced process understanding. Accordingly, this study proposes the treatment of such variables as multi-variable systems, allowing internal relationships between the variables, and for researchers to relate these constituent parts to antecedent and consequent variables in variegated ways.

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