



Perception Gap vs. Performance Gap: An Integrative Performance Management Framework for Service Supply Chains

Sobhan Asian

La Trobe University, Australia

Email: s.asian@latrobe.edu.au

Dawei Lu

University of Warwick, UK

Gurdal Ertek

Abu Dhabi University, UAE

Mete Sevinc

Cognizant Technology Solutions Corp., Netherlands



Outline

- Perception Gap & Performance Gap
- Motivation
- Study Scope
- Earlier Research: "3-Level Gaps Model"
- Hypotheses
- Data
- Data Envelopment Analysis (DEA)
- Statistical methods
- Smart DEA Solver Software
- Framework
- Analysis & Results
- Managerial Implications
- Future Research
- Acknowledgement

About Me



- **Name:**
Sean ASIAN (ah-see-ahn)
- **Qualifications:**
PEng in Industrial Engineering (IUST, Iran)
PhD in Supply Chain Management (NTU, Singapore)
- **Worked in:**
NTU and A*STAR (Singapore)
Siemens-Dematic (Singapore)
RMIT (Australia)
LTU (Australia)
- **Expertise:**
Logistics and supply chain management, Project management
- **Hobbies:**
Charity (Education for disadvantaged children), Tennis

Perception Gap & Performance Gap

- Perception gap

- Between different *parties* in a supply chain,
- Regarding their *perception* of any aspect of the *supply chain relationship*.



- This paper

- *Perception gap* regarding the **relative importance of Key Performance Indicators (KPI)**.

- Performance gap

- Between different parties in a supply chain,
- Regarding their perception of any aspect of *performance*.



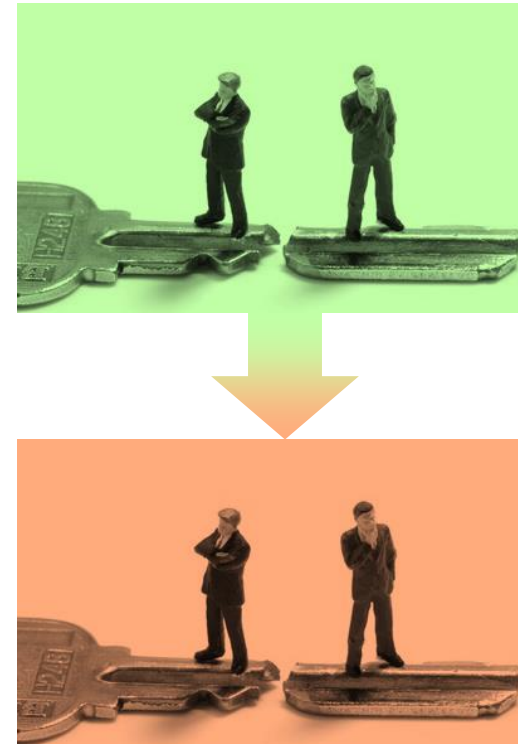
- This paper

- *Performance gap* regarding the **supply chain metrics**.

Motivation

"Could perception gap be an underlying cause of inferior performance?"

- When stakeholders in a (service) supply chain have different perceptions on what is important, Does this associate with a gap in performance?
- **Lack of empirical evidence.**



Study Scope



Research Objectives

- Investigating the **existence of perception and performance gaps** along the supplier-buyer interface;
- Examining the **association between** the perception gaps and the performance;
- Constructing an **integrative framework** that factors-in the perception gap into service supply chains and **measures them through meta-KPIs**.

Study Scope

Key Contributions

- Focusing on perceptions of both the buyer and supplier with an **objective of reducing perception and performance gaps**.
- Targeting specifically on the **importance (in the form of weights) given to KPIs and performance evaluations** by adjacent supply chain partners **for the same KPIs**.
- Offering a **novel integrative framework** that provides the specific steps on how to compute the perception gaps and performance gaps, along with the associations between them.

Study Scope

Practical Implications

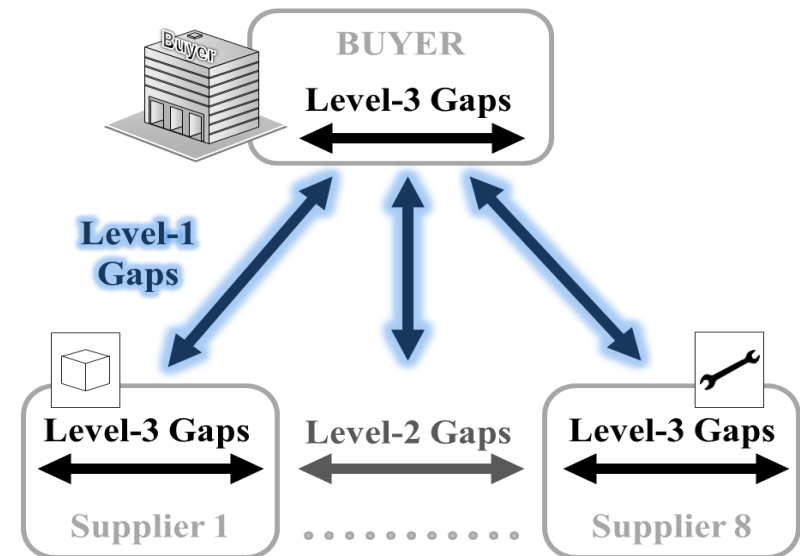
- Suggested focus on strategically **resolving the differences in perceptions of the importance of the indicators.**
- Proposing a **new set of meta-KPI that measures the differences in weights given to KPI.**



Earlier Research:

"3-Level Gaps Model"

- For any service supply chain echelon between two tiers composed of several suppliers (tier) and single buyer (tier), the perception gaps can be illustrated and framed by the **3-Level Gaps model**



Hypotheses

Hypothesis 1. Perception and performance **gaps exist** between the buyer and the supplier.

Hypothesis 2. Perception gap values at the (supplier, KPI) granularity *correlate* with performance gap values based on *individual KPIs*. In short, **performance gap correlates with perception gap**.

Hypothesis 3. Performance **gap still exists** when *multi-dimensional* evaluations are *reduced* to the single dimension of **efficiency score**.

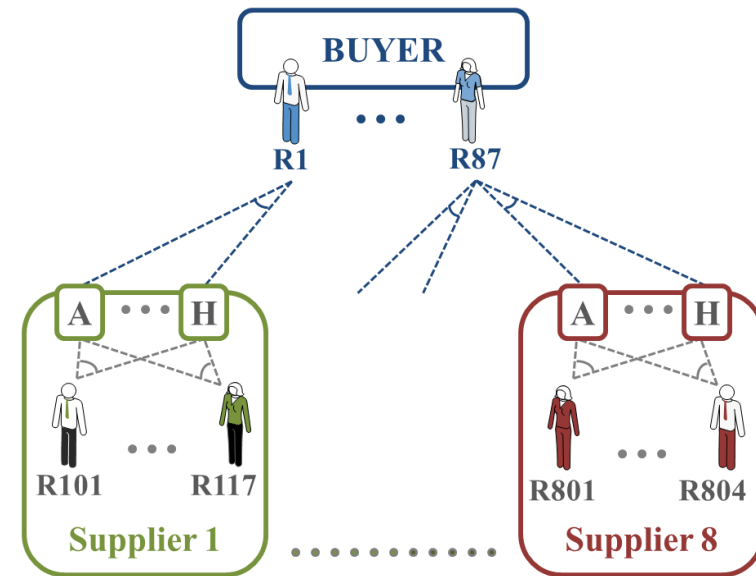
Hypothesis 4. **Correlation** between *perception* and *performance gap* can be **higher** for some KPIs.



Data

- A major **UK-based insurance service** corporation.
- Company's **motor insurance business**, the "**Motor-Insurer**" (buyer).
- **8 key suppliers** (of the Motor-Insurer)

Supplier	Service	No. of responses	No. of responses
		(Buyer)	(Supplier)
S1	Motor Dealer	24	17
S2	Motor Dealer	7	18
S3	Body Shop	8	18
S4	Body Shop	16	22
S5	Body Shop	25	35
S6	Collision Repair Shop	27	3
S7	Collision Repair Shop	5	3
S8	Electrical Testing	20	4

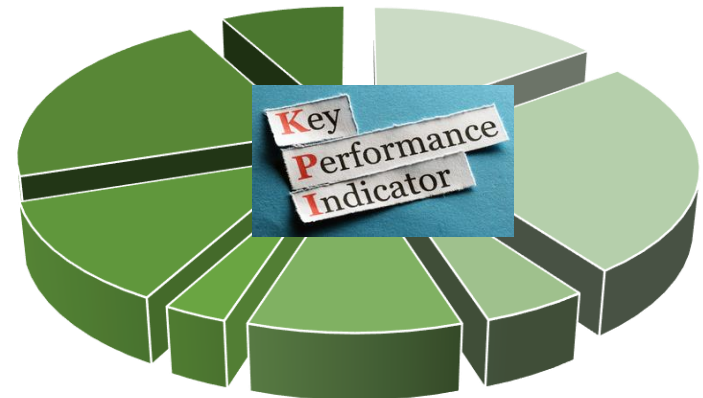


Data

Question Set 1 (perception gaps): Allocate 100 points among the eight performance criteria below wrt importance to the Motor-Insurer's business :

Question Set 2 (performance gaps): How well were these eight performance criteria delivered or achieved by each of the suppliers (on a scale from 1 to 10)?

- A. Service with a real 'wow' factor being prepared to go the extra mile
- B. Innovative products or services
- C. Low price / charges
- D. Fast response to your requests
- E. Being on time
- F. Not making mistakes
- G. Personal touch
- H. Dealing well with problems and queries



Data – Available for Reproducibility

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	DMU	INPUT	Q1A	Q1B	Q1C	Q1D	Q1E	Q1F	Q1G	Q1H	Q2A	Q2B	Q2C	Q2C	Q2D	Q2E	Q2E	Q2F	Supplier	Respondent
2	3_for_1	1	35	0	0	20	15	15	5	10	5	3	2	4	6	4	2	3	1	3
3	8_for_1	1	15	10	10	15	15	10	10	15	5	3	4	5	5	3	3	3	1	8
4	19_for_1	1	26	0	0	0	23	45	0	6	8	5	3	3	7	8	5	8	1	19
5	21_for_1	1	50	0	0	0	25	25	0	0	8	1	1	8	7	8	8	8	1	21
6	22_for_1	1	3	7	27	19	16	11	9	8	3	1	3	1	2	1	3	1	1	22
7	25_for_1	1	5	5	5	25	25	5	6	24	2	2	2	7	7	3	4	7	1	25
8	29_for_1	1	0	0	0	0	0	0	0	100	10	10	10	10	10	10	10	10	1	29
9	30_for_1	1	20	0	30	20	0	10	0	20	8	5	8	8	3	8	8	8	1	30
10	33_for_1	1	8	5	2	30	8	9	18	20	1	1	1	1	1	1	1	1	1	33
11	34_for_1	1	0	0	0	0	0	0	0	100	1	1	1	1	1	1	1	10	1	34
12	36_for_1	1	14	0	14	16	14	14	14	14	3	2	5	9	9	9	4	9	1	36
13	37_for_1	1	12	12	12	12	16	12	12	12	7	5	5	9	9	9	9	10	1	37
14	40_for_1	1	6	6	23	15	17	13	8	12	7	8	5	6	7	8	6	8	1	40
15	42_for_1	1	50	0	0	0	0	0	0	50	1	1	1	1	1	1	1	10	1	42
16	45_for_1	1	40	0	0	60	0	0	0	0	10	10	8	8	8	8	8	8	1	45
17	52_for_1	1	30	0	0	20	10	10	10	20	6	5	5	8	7	7	6	7	1	52
18	56_for_1	1	29	0	29	12	0	9	0	21	6	1	6	5	5	6	4	8	1	56
19	59_for_1	1	2	3	28	29	29	4	3	2	2	2	2	2	2	2	2	2	1	59
20	60_for_1	1	0	0	13	35	13	13	13	13	1	1	8	9	8	8	8	8	1	60
21	67_for_1	1	0	0	100	0	0	0	0	0	1	1	1	1	1	1	1	1	1	67
22	80_for_1	1	7	41	35	0	0	0	17	0	1	1	1	1	1	1	1	1	1	80
23	81_for_1	1	20	10	20	15	15	10	5	5	3	2	3	4	4	5	4	3	1	81
24	84_for_1	1	10	0	0	10	10	30	10	30	1	1	1	1	1	1	1	1	1	84
25	87_for_1	1	13	12	13	12	13	12	12	13	8	8	8	8	8	8	8	8	1	87

03 Data for the DEA Model 04 Respondents Database 05 Table A1 - KPI Definitions 06 Data for Lu et al. (2018) 07 Lookup Tables



Data – Survey Template

	A	B	C	D	E	F
23						
24						
25	Question 1 (Q1): IMPORTANCE WEIGHTS					
26	Please indicate the relative importance of each of the following dimensions of performance.					
27	For each, please give a number between 0 and 100 , where 0 denotes least importance and 100 denotes highest importance .					
28	IMPORTANT: The values given for this question should ADD UP TO 100 .					
29					Validation Check	
30	Q1A	Service with a real “wow” factor being prepared to go the extra mile	35		Entered value is valid.	
31	Q1B	Innovative products or services	0		Entered value is valid.	
32	Q1C	Low price / charges	0		Entered value is valid.	
33	Q1D	Fast response to your requests	20		Entered value is valid.	
34	Q1E	Being on-time	15		Entered value is valid.	
35	Q1F	Not making mistakes	15		Entered value is valid.	
36	Q1G	Personal touch	5		Entered value is valid.	
37	Q1H	Dealing well with problems and queries.	10		Entered value is valid.	
38		SUM	100		Bravo! Entered values SUM to 100.	

	A	B	C	D	E	F
41						
42						
43	Question 2 (Q2): PERFORMANCE SCORES					
44	Please evaluate the performance of the mentioned supplier with regards to each of the following dimensions of performance .					
45	For each, please give a number between 0 and 10 , where 0 denotes worst performance and 10 denotes best performance in that dimension.					
46					Validation Check	
47	Q2A	Service with a real “wow” factor being prepared to go the extra mile	5		Entered value is valid.	
48	Q2B	Innovative products or services	3		Entered value is valid.	
49	Q2C	Low price / charges	2		Entered value is valid.	
50	Q2C	Fast response to your requests	4		Entered value is valid.	
51	Q2D	Being on-time	6		Entered value is valid.	
52	Q2E	Not making mistakes	4		Entered value is valid.	
53	Q2E	Personal touch	2		Entered value is valid.	
54	Q2F	Dealing well with problems and queries.	3		Entered value is valid.	
55		SUM	29		Everything seems fine.	
56						
57						

Data Envelopment Analysis (DEA)

- Highly effective methodology for supplier evaluation / selection
- Benchmarks a group of entities through **efficiency scores**.
(Cooper *et al.*, 2006; Gattoufi *et al.*, 2004)
- The **most suitable method among MCDM** methods due to its efficient dimensionality-reduction capabilities with minimal data requirements.
- Reflects multi-dimensional input-output relationships with a **single dimensional (efficiency) score (between 0 and 1)**.

Data Envelopment Analysis (DEA)

Applied in our study

- **To evaluate the performances of service suppliers** of the Motor-Insurer company.
- DEA was essential for summarizing the values for all the eight criteria as a **single performance score**.
- **BCC model family** was adopted because of its robustness.
- **Single auxiliary input**, with value of 1 for all the DMUs.
(Liu *et al.*, 2011)
- **Eight outputs**, corresponding to values of performance criteria.

“SmartDEA Solver” Software

SmartDEA Solver v.1.2

Model Solution Summary

DMU Name	Efficiency
DMU_1	1
DMU_2	0.9248
DMU_3	0.8056
DMU_4	1
DMU_5	0.9983
DMU_6	0.9475
DMU_7	1
DMU_8	0.8816
DMU_9	0.7864
DMU_10	0.9734
DMU_11	0.951
DMU_12	1
DMU_13	0.8258
DMU_14	0.7753
DMU_15	0.9817
DMU_16	1
DMU_17	0.8171
DMU_18	1
DMU_19	0.841

DMU_6

DMU Detail

DMU NAME	EFFICIENCY S...			
DMU_6	0.8475			
REFERENCE ...				
DMU Name	Weight			
DMU_18	0.185			
DMU_18	0.815			
PROJECTION				
DMU VO	Original Value	Projection	Difference	%
Input1 Name	12	11.37	-0.63	-5.25
Input2 Name	689	652.826	-36.174	-5.25
Output1 Name	12	14.075	2.075	17.29

<< Back

Efficient

Inefficient

Generate Report



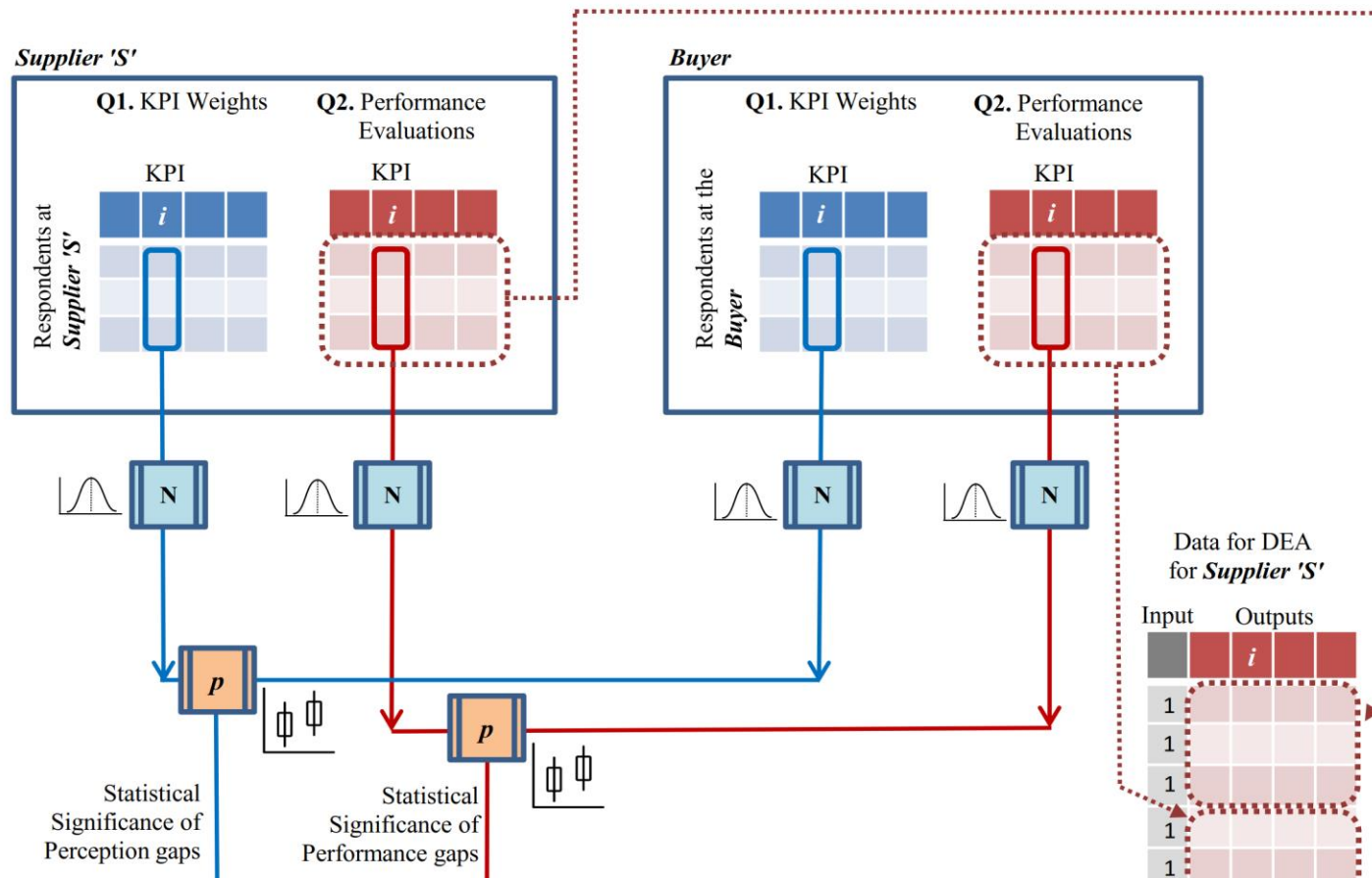
Statistical Methods

To discover the association between perception and performance gaps and to test the proposed hypotheses, several statistical tests have been conducted:

- The **Shapiro-Wilk** test : normal distribution
- The **t-test** and **Wilcoxon** rank-sum test : the statistical significance of the differences in the means of two samples
- The **Spearman** rank correlation test: the correlation

Integrative Analytical Framework

For Each Supplier 'S'



N: Shapiro-Wilk normality test
p: Two-sample comparison
U: Combine
D: DEA model
C: Criterion



The research framework is divided into two main sections: the top section for individual supplier analysis and the bottom section for aggregated results.

Top Section (Individual Supplier Analysis):

- Statistical Significance of Perception gaps (Hypothesis 1):** This path starts with a blue arrow pointing to a table labeled "Table 2 (Hypothesis 1)". The table has columns for "KPI" and "Suppliers". A specific KPI is labeled "i". This leads to a box labeled ρ (Hypothesis 2).
- Statistical Significance of Performance gaps (Hypothesis 1):** This path starts with a red arrow pointing to a table labeled "Table 3 (Hypothesis 1)". The table has columns for "KPI" and "Suppliers". A specific KPI is labeled "i". This leads to a box labeled p (Hypothesis 2).
- Efficiency Scores for Supplier 'S':** This path starts with a green arrow pointing to a table labeled "Table 4 (Hypothesis 3)". The table has columns for "KPI", "Perf. Gap", and "Suppliers". A specific KPI is labeled "i". This leads to a box labeled p (Hypothesis 2).
- Statistical Significance of Performance gaps for Supplier 'S':** This path starts with a blue arrow pointing to a box labeled N . This leads to a box labeled p (Hypothesis 2).

Bottom Section (Aggregated Results):

- Results accumulated over all suppliers:** This section shows the final results for all suppliers. It includes a table labeled "Table 5 (Hypothesis 4)" with columns for "KPI", "Perf. Gap", and "Suppliers". A specific KPI is labeled "i". This leads to a box labeled ρ (Hypothesis 4).

Analysis & Results

Table 2. Statistical significance (p-values) of the Level-1 **perception gaps** for each (supplier, KPI) pair.

Supplier	Key Performance Indicators (KPIs)							
	A	B	C	D	E	F	G	H
S1	0.8526	0.0225**	0.1101	0.1815	0.9041	0.2740	0.7573	0.8944
S2	0.5153	0.0043**	0.0125**	0.2359	0.7010	0.3442	0.2303	0.5051
S3	1.0000	0.0319**	0.0825	0.3375	0.2275	0.9555	0.7764	0.5955
S4	0.0353**	0.0562*	1.0000	0.4110	0.2808	0.0824*	0.0357**	0.0025**
S5	0.0232**	0.0000**	0.1234	0.3514	0.1520	0.0575*	0.1749	0.0023**
S6	1.0000	0.1502	0.1152	0.9720	0.0373**	0.2366	0.7801	1.0000
S7	0.0148**	0.0101**	0.0734*	1.0000	0.9480	0.1685	0.0314**	0.0336**
S8	0.8526	0.6142	0.1313	0.4994	0.5550	0.2636	0.0800*	0.0343**

Notes: ** p<0.05; * p<0.10

Analysis & Results

Table 3. Statistical significance of the Level-1 **performance gaps** for each pair

Supplier	Key Performance Indicators (KPIs)							
	A	B	C	D	E	F	G	H
S1	0.0149**	0.0693*	0.0007**	0.0431**	0.0395**	0.2419	0.0578*	0.0904*
S2	0.0834*	0.0828*	0.1167	0.1189	0.0419**	0.1054	0.0226**	0.0264**
S3	0.1149	0.0514*	0.0636*	0.4140	0.2068	0.4082	0.5147	0.0531*
S4	0.0001**	0.0074**	0.0800*	0.0002**	0.0008**	0.0015**	0.0003**	0.0016**
S5	0.0000**	0.0000**	0.0001**	0.0008**	0.0004**	0.0000**	0.0000**	0.0000**
S6	0.7518	0.3580	0.8610	0.8074	0.4644	0.5759	0.5782	0.7805
S7	0.4272	0.4214	0.7336	0.5757	0.2612	0.2238	0.1254	0.1350
S8	0.0323**	0.3489	0.0001**	0.0001**	0.0530*	0.0070**	0.0310**	0.0039**

Notes: ** $p < 0.05$; * $p < 0.10$

Tables 2 and 3 confirm that **Hypothesis 1** (existence of perception and performance gaps) is supported by data.

Analysis & Results

Because the perception gaps and performance gaps both exist, the next question is whether they are associated (Hypothesis 2).

Hypothesis 2: Association between the gaps

Using the data in Tables 2 and 3, the Spearman correlation value obtained is 0.5167.

The p-value corresponding to this test is $p=0.00004562$, suggesting that there is a significant correlation between the p-values of the perception and performance gaps.

This suggests that ***Hypothesis 2*** is also ***supported*** by data

Analysis & Results

Table 4. Comparison of average efficiency scores, as evaluated by the buyer and the suppliers, based on DEA.

Supplier	Avg. Eff. Buyer	Avg. Eff. Supplier	Perf. Gap	Shapiro p- values (buyer)	Shapiro p-values (supplier)	Wilcox p- values	t.test p-values
S1	0.6500	0.8588	0.2088	0.0014	0.0001	0.0189**	-
S2	0.6571	0.8889	0.2317	0.8525	0.0004	0.0279**	-
S3	0.7500	0.9333	0.1833	0.3297	0.0003	0.0057**	-
S4	0.6750	0.9045	0.2295	0.0111	0.0000	0.0001**	-
S5	0.5320	0.8486	0.3166	0.0507	0.0000	0.0000**	-
S6	0.5852	0.6000	0.0148	0.2151	0.2196	-	0.9589
S7	0.7200	1.0000	0.2800	0.1180	-	-	0.1660
S8	0.5300	0.9250	0.3950	0.0885	0.2725	-	0.0001**
Average	0.6374	0.8699	0.2325	-	-	-	-

Hypothesis 3 is supported by data.

Analysis & Results

Table 5. Correlations between perception gaps and performance gaps, after multi-dimensional performance evaluations were reduced to single dimension through DEA.

Supplier	Perception Gap p-values based on Key Performance Indicators (KPIs)								Perf. Gap
	A	B	C	D	E	F	G	H	p-values
S1	0.8526	0.0225	0.1101	0.1815	0.9041	0.2740	0.7573	0.8944	0.0189**
S2	0.5153	0.0043	0.0125	0.2359	0.7010	0.3442	0.2303	0.5051	0.0279**
S3	1.0000	0.0319	0.0825	0.3375	0.2275	0.9555	0.7764	0.5955	0.0057**
S4	0.0353	0.0562	1.0000	0.4110	0.2808	0.0824	0.0357	0.0025	0.0001**
S5	0.0232	0.0000	0.1234	0.3514	0.1520	0.0575	0.1749	0.0023	0.0000**
S6	1.0000	0.1502	0.1152	0.9720	0.0373	0.2366	0.7801	1.0000	0.9589
S8	0.8526	0.6142	0.1313	0.4994	0.5550	0.2636	0.0800	0.0343	0.0001**
Correlation	0.6728	0.1786	-0.6429	-0.0714	0.1071	0.5357	0.7500	0.8929	
p-values	0.0977*	0.7131	0.1389	0.9063	0.8397	0.2357	0.0663*	0.0123**	

Hypothesis 4 is supported by data.

Managerial Implications: Meta-KPI

Perception gap can *itself* be tracked as a **key performance indicator (KPI)** in supplier development.



Performance gap can also be tracked.

Correlation between the perception and performance gaps can be tracked as additional KPI.

Reducing the perception gap for those most crucial KPIs should have precedence in supplier collaboration and integration efforts.

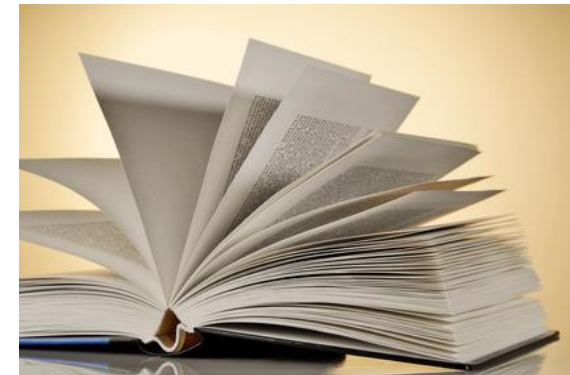
Future Research

1. Are there certain **supplier, buyer, product/service, industry characteristics** that contribute to the **magnitude of the association** between the perception and performance gaps?
2. How can one **explain** that the perception gap in **specific measures** have a relatively **higher association** and possible influence on the performance gap?
3. How does perception gap correlate with performance gap, **when the effects of other factors** that contribute to the service supply chain performance **are also considered**? Can researchers and analysts use alternative analytical techniques in investigating this problem?

Acknowledgement

The case study partner for initiating the joint industry project and providing information, data, and continuous support throughout the study.

The respondents at the suppliers and at the buyer for participating in the survey and supporting the study.



Questions & Comments

Thank you