

Uncovering Value in Knowledge-based Services: Monetizing Latent Service Quality Indicators for Source Selection*

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*Based on completed dissertation essays.

Research Questions



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1) How are knowledge-based services (KBS) defined for business-to-government (B2G) markets?



2) How does perceived service quality manifest as a construct in B2G KBS?



3) What are the most efficient and effective indicators of perceived KBS quality that impact perceptions of value?



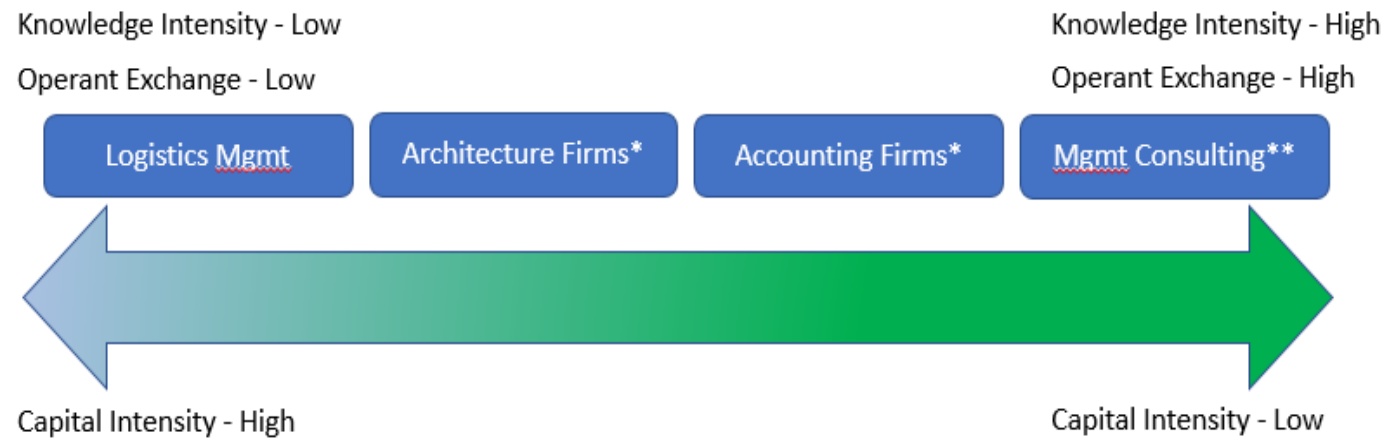
4) Can these underlying indicators be monetized for operational use in making best value determinations for KBS?



Defining Knowledge-based Services (KBS)



- *KBS: Those services in which the primary medium of exchange is a transfer of expert advice, knowledge, processes or information. Such services are generally low in capital intensity and high in knowledge intensity.*



- *Classical Professional Service Firm (PSF)
- **Neo-PSF

PSF definition Source: von Nordenflycht, 2010, pp. 166

Purpose, Issue, Motivation & Goals



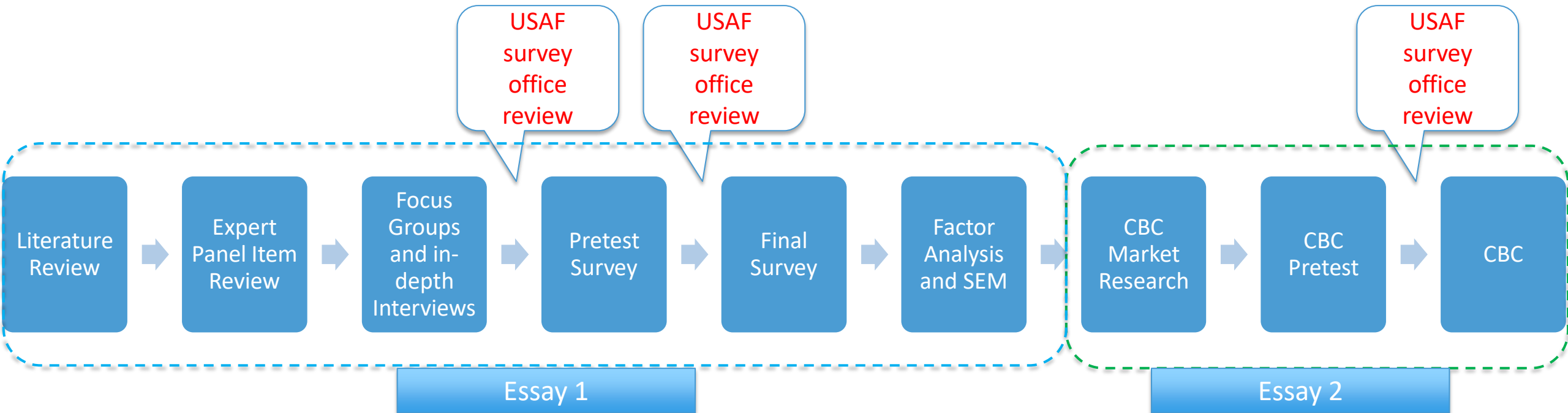
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- **PURPOSE:** Improve source selection and performance management for B2G KBS
- **ISSUE:** KBS are inherently hard to measure due to intangible and perishable nature of service quality. Current performance and evaluation criteria are do not adequately discriminate between service providers.
- **MOTIVATION:** Consistent call to improve service contract selection and management by leadership in government services and calls to increase research into B2G markets by leading marketing academics (Lilien 2016; Grewal and Lilien, 2012)
- **PRIMARY GOALS:** Solve a problem for B2G acquisition participants; extend the literature on perceived service quality and perceived value.

Essay 1, Essay 2



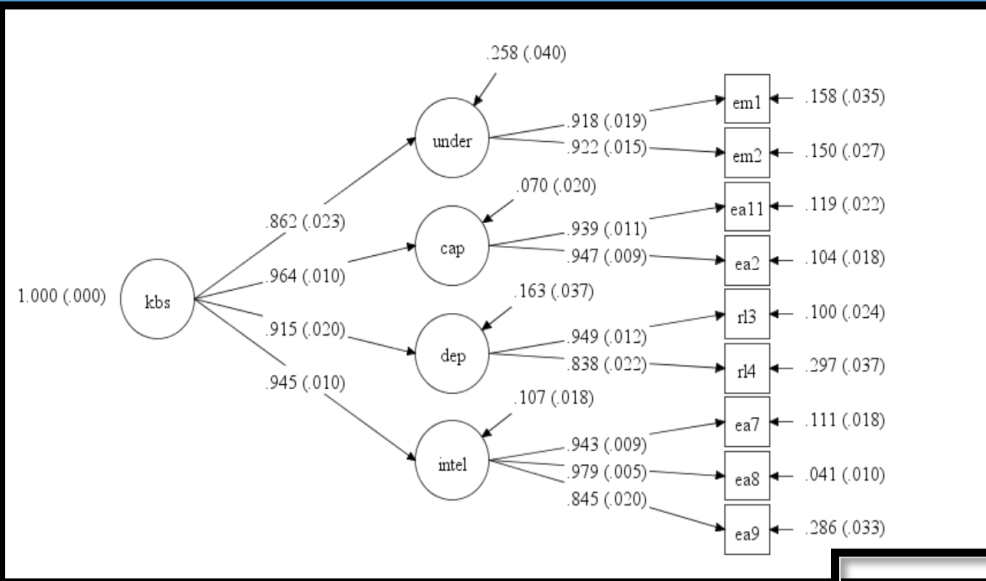
- Mixed methods approach of qualitative, psychometric and conjoint analysis.



SEM = Structural Equation Modeling
CBC = Choice-based Conjoint

Essay 1: KBS Perceived Quality

2nd Order Factor Model



The 2nd Order Factor scale represents the correct measures (i.e., effectiveness).

639 Respondents

- 445 Contracting, 194 PM

	RMSEA	CFI	TLI	SRMR	Loading on Second Factor*		
Second Order Factor Model	0.036	0.993	0.99	0.011			
Understanding the Customer	Item Code	Loading	S.E.	Two-tailed p-value	KBS QUALITY		
1. The firm's employees were knowledgeable about our mission/goals.	EM1	0.918	0.019	0.000	0.791316		
2. The firm's employees were knowledgeable about our processes and procedures.	EM2	0.922	0.015	0.000	0.794764		
Capability							
11. The firm's employees were highly capable.	EA11	0.939	0.011	0.000	0.905196		
2. The firm's employees provided a positive contribution to our team.	EA2	0.947	0.009	0.000	0.912908		
Intelligence/Knowledge							
7. The firm's employees provided intelligent solutions.	EA7	0.943	0.009	0.000		0.891135	
8. The firm's employees provided expert advice.	EA8	0.979	0.005	0.000		0.925155	
9. The firm's employees filled a knowledge gap in our organization.	EA9	0.845	0.02	0.000		0.798525	
Dependability/Reliability							
3. The firm's employees were dependable.	RL3	0.949	0.012	0.000			0.868335
4. The firm provided its services at the time it promised to do so.	RL4	0.838	0.022	0.000			0.76677
KBS QUALITY							
Understanding the Customer	UNDER	0.862	0.023	0.000			
Capability	CAPS	0.964	0.01	0.000			
Dependability/Reliability	DEP	0.915	0.02	0.000			
Intelligence/Knowledge	INTEL	0.945	0.01	0.000			

*Calculated as the product of item and factor loadings. I.e. EM1 loading on KBS Quality is = 0.918*0.862 = 0.791316

Exploratory Mean Comparisons



Acquisition Community Type	KBS Perceived Quality Mean Scores	Std.Dev.	min.	max.	N	P>F
Contracting Respondent (AQC)	5.622285	1.176261	1.125	7	445	0.0084
Program Manager Respondent (AQX)	5.88939	1.17	1	7	194	

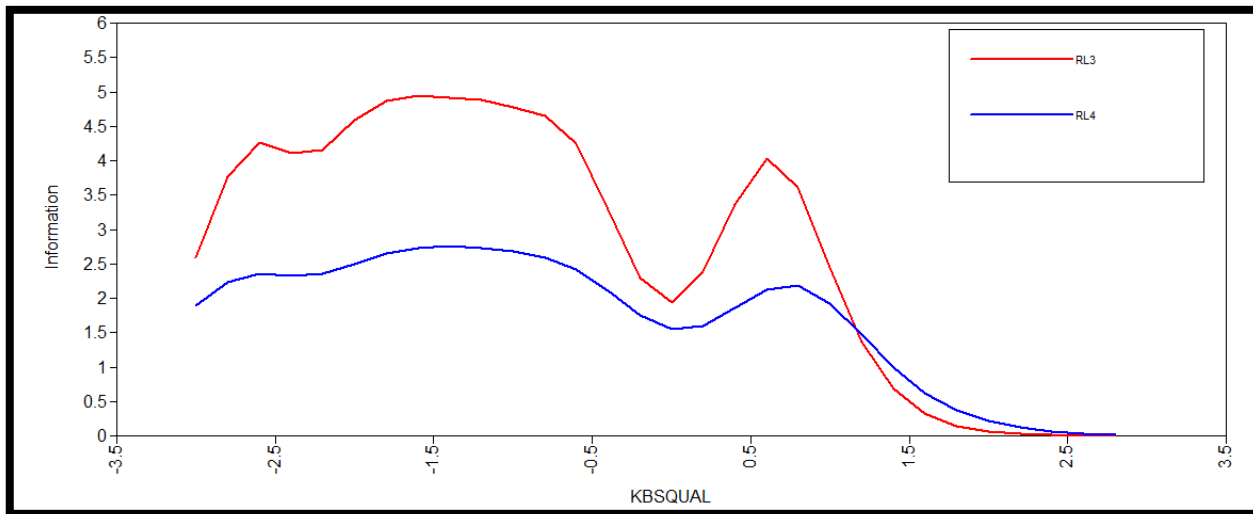
DAWIA Certification Levels	KBS Perceived Quality Mean Scores	Std.Dev.	min.	max.	N	t-test notes
Contracting Level 1	6.106667	1.136966	3.125	7	25	*Significantly lower than all other levels except PM 1, at P<.05. Note that many who hold CON 3 also hold PM 1. **Mean is 5.89 if we remove CON 3 cert holders.
Contracting Level 2	5.835737	1.200824	1	7	104	
<i>Contracting Level 3*</i>	<i>5.481109</i>	<i>1.194904</i>	<i>1.125</i>	7	<i>311</i>	
Program Manager Level 1**	5.628613	1.159445	2	7	173	
Program Manager Level 2	5.976515	1.067747	1.833333	7	110	
Program Manager Level 3	5.905128	1.153514	2.083333	7	65	
Other Level Not Specified	5.805682	1.157914	2.083333	7	110	
Job Type	KBS Perceived Quality Mean Scores	Std.Dev.	min.	max.	N	t-test notes
<i>Contracting Officer/Administrator*</i>	<i>5.597733</i>	<i>1.196747</i>	<i>1.125</i>	7	<i>408</i>	*Significantly lower than PM or Engineer means at P<.05.
Program Manager	5.918573	1.127448	1.833333	7	153	
Contracting Officer Representative	5.714583	1.536488	1	7	20	
Engineer	6.047794	0.9555092	3.541667	7	34	
Other Job Not Specified	5.630208	0.9610714	3.708333	7	24	

- AQC personnel had statistically lower perceived service quality scores than those in the program management community.
- Contracting officers and DAWIA CON level 3 personnel had lower perceived quality means.
- Takeaway: Fully certified contracting personnel are the most discerning on perceived quality. Perhaps best to keep them as gatekeepers.

Item Response Theory – 4 attributes



- We used item response theory to reduce each first-order construct to a single item/attribute for essay 2's choice-based conjoint analysis.



IRT allowed us to establish the item that provided the most information within each first order construct. In this example we select RL3.

The reduced scale represents the most informative measures (i.e., efficiency).

Perceived Service Quality Attributes



Attribute	Description to Respondents	Explanation from Focus Groups
1. Firm employees' capability.	KBS firm employee's demonstrated capability to perform their work on previous contracts.	Employees within a KBS firm are capable to perform the required work described in the contract. They have the means necessary. They can do what we direct them to do.
2. Firm employees' ability to provide intelligent solutions.	KBS firm employee's demonstrated ability to provide intelligent solutions to the customer on previous contracts.	Employees within a KBS firm provide expert advice and knowledge beyond what the customer could otherwise discover or create with organic capabilities. They fill a knowledge gap in the organization. They can tell us what we should be doing.
3. Firm employees' dependability.	KBS firm employee's dependability on previous contracts.	Employees within a KBS firm provide reliable service, when and as expected. They will do what is required.
4. Firm's understanding of customer organizational requirements.	KBS firm's demonstrated ability to understand the customer's organizational requirements on previous contracts.	The KBS firm has empathy and understanding for the specific requirements, processes and procedures of the customer's organization (i.e. the mission in defense terms). They understand the customer's motivations and goals. They understand what needs to be done and why.

Perceived KBS Quality attributes taken from indicators discovered in Study 1 and used in CBC in Study 2.

Essay 2: CBC Design Considerations that We Followed



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Saliency becomes paramount in inducing incentive-aligned behavior (Smith, 1976*)



Properly framed the timing of the tradeoff



Set attribute levels in line with real-world B2G levels



Sampled respondents from B2G markets (n=631)



Established real-world monetary constraints: budgets and estimates



Tested relevant choice incentives with four methods for robustness

Conjoint-based Choice Design Levels



Perceived Quality Attribute Levels

Streamlined scale rating	Adjectival rating from Table 5, DoD SS Guide	Description
High	Substantial Confidence	Based on the offeror's recent/relevant performance record, the Government has a <i>high</i> expectation that the offeror will successfully perform the required effort.
Reasonable	Satisfactory Confidence	Based on the offeror's recent/relevant performance record, the Government has a <i>reasonable</i> expectation that the offeror will successfully perform the required effort.
Low	Limited Confidence	Based on the offeror's recent/relevant performance record, the Government has a <i>low</i> expectation that the offeror will successfully perform the required effort.
Neutral	Neutral Confidence	No recent/relevant performance record is available or the offeror's performance record is so sparse that no meaningful confidence assessment rating can be reasonably assigned. The offeror may not be evaluated favorably or unfavorably on the factor of past performance.

Price Levels

Government Estimate is \$20,370,000.00.
Government Budget is \$23,000,000.00.

Price Levels

\$18.53M
\$19.46M
\$20.38M
\$21.31M
\$22.24M

22 Choice Tasks

Price Levels Formed from Field Research

Robustness: CBC Realism Inducing Conditions

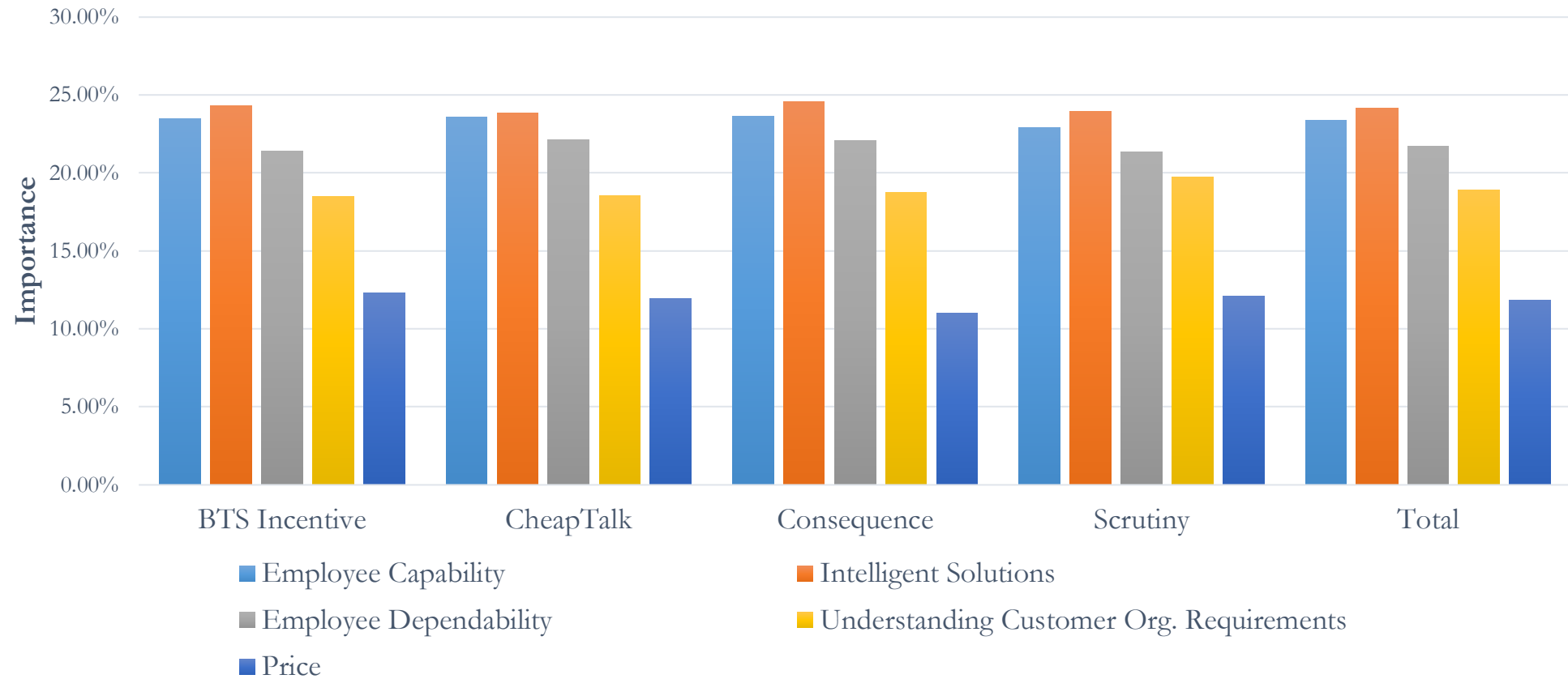


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- **BTS with Incentive** → Respondents told they would receive a truth score. Highest truth score gets an incentive trip to UNC for executive education (Weaver and Prelec, 2013).
- **Cheap Talk** → Respondents read a script from the researcher explaining how hypothetical bias occurs and we ask them to help us combat it by being realistic in their responses (Landry and List, 2007).
- **Consequence** → Respondents told that their responses could have impact on real public procurement policy decisions (Landry and List, 2007; Barrage and Lee, 2010).
- **Expert Scrutiny** → (new method) Respondents told that their responses would be evaluated by public procurement/acquisition experts to determine reasonableness.



Importance by Survey Condition (N=631)



Survey method does not impact importance of attributes.

Buyer Willingness to pay (WTP)



Panel 1: Marginal WTP by Attribute Level				
WTP - Capability	Low	Neutral	Reasonable	High
Low				
Neutral	4.4504			
Reasonable	6.3105	1.748435		
High	7.5767	2.834391	1.058497	
WTP - Intelligence	Low	Neutral	Reasonable	High
Low				
Neutral	4.436			
Reasonable	6.4478	1.679883		
High	7.5735	2.790106	1.1097298	
WTP - Dependability	Low	Neutral	Reasonable	High
Low				
Neutral	4.3932			
Reasonable	5.8998	1.294115		
High	6.936	2.128312	0.83132362	
WTP - Understanding	Low	Neutral	Reasonable	High
Low				
Neutral	3.5247			
Reasonable	5.0154	1.272459		
High	5.7139	2.074612	0.82571912	

Most Likely Tradeoff

6%

6%

4%

4%

In \$M

Maximum trade for reasonable-high levels of perceived quality is ~22%

Fully low and neutral rankings are essentially non-viable offers when compared to reasonable or high offers.

WTP and Monetary Tradeoffs



Panel 1: Marginal WTP by Attribute Level					Panel 2: Change in Shares by Attribute Level					Panel 3: Quality-Price Tradeoff by Attribute Level				
WTP - Capability	Low	Neutral	Reasonable	High	ΔShares - Capability	Low	Neutral	Reasonable	High	Tradeoff - Capability	Low	Neutral	Reasonable	High
Low					Low					Low				
Neutral	4.450403				Neutral	0.45				Neutral	24%			
Reasonable	6.310466	1.7484347			Reasonable	4.84	31.71			Reasonable	34%	9%		
High	7.576713	2.8343906	1.058497		High	7.79	52.18	36.22		High	41%	15%	6%	
WTP - Intelligence	Low	Neutral	Reasonable	High	ΔShares - Intelligence	Low	Neutral	Reasonable	High	Tradeoff - Intelligence	Low	Neutral	Reasonable	High
Low					Low					Low				
Neutral	4.435991				Neutral	0.91				Neutral	24%			
Reasonable	6.447763	1.6798825			Reasonable	5.03	31.21			Reasonable	35%	9%		
High	7.573535	2.7901056	1.1097298		High	7.94	51.88	35.99		High	41%	15%	6%	
WTP - Dependability	Low	Neutral	Reasonable	High	ΔShares - Dependability	Low	Neutral	Reasonable	High	Tradeoff - Dependability	Low	Neutral	Reasonable	High
Low					Low					Low				
Neutral	4.393207				Neutral	0.33				Neutral	24%			
Reasonable	5.899822	1.2941148			Reasonable	3.51	23.38			Reasonable	32%	7%		
High	6.935977	2.1283119	0.83132362		High	5.58	39.88	26.23		High	37%	11%	4%	
WTP - Understanding	Low	Neutral	Reasonable	High	ΔShares - Understanding	Low	Neutral	Reasonable	High	Tradeoff - Understanding	Low	Neutral	Reasonable	High
Low					Low					Low				
Neutral	3.52467				Neutral	0.29				Neutral	19%			
Reasonable	5.015444	1.2724589			Reasonable	3.05	22.47			Reasonable	27%	7%		
High	5.713935	2.0746117	0.82571912		High	5.03	40.07	27.22		High	31%	11%	4%	
*Note: Marginal WTP reported is the median of 631 respondents														
Change in shares (Δ) is calculated based on the median price offered (\$20.38M). It is also reflective of an increase in level for only the attribute listed (i.e. comparing low-to-neutral capability compares a profile with all low level ratings and one with all low level ratings except for capability set at neutral)														
Tradeoffs are calculated based on WTP relative to the lowest possible price offered (\$18.53M).														
Attribute	WTPmin	WTPmedian	WTPmax	WTPmean	WTPstd.dev.									
Capability	0.299861	4.0514631	43.33519	5.167808	4.411736									
Intelligence	0.409775	4.1639442	48.5266	5.359632	4.753538									
Dependability	0.227926	3.7404234	43.93012	4.787026	4.160798									
Understanding	0.22898	3.1824856	36.38744	4.250234	4.033088	*Note: This table reports statistical values for total WTP by attribute.								



Question 1) KBS is defined as *those services in which the primary medium of exchange is a transfer of expert advice, knowledge, processes or information. Such services are generally low in capital intensity and high in knowledge intensity.*

Question 2) KBS manifests as a second-order factor construct consisting of employee capability, employee ability to offer intelligent solutions, employee dependability and the firm's understanding of the customer's organizational requirements.

Question 3) These first-order factors are distilled into a single indicator for each factor for efficiency and effectiveness.

Question 4) Using WTP calculations from a sample of 631 public buying agents, we monetized the first-order factors of perceived KBS quality for use in source selections.

Recommendations



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Use the four-factor perceived KBS quality measure (KBSQual) to conduct monetary tradeoffs the same as, or similar to, quality-infused price methodology (QIP©) (Finkenstadt & Hawkins, 2016).



Create a time-weighted, point-of-service quality reporting system based on KBSQual scores to enable real-time service quality control (examples in proceedings paper).



Maintain fully certified contracting officers as the system gatekeepers for final recorded scores to be used in QIP© and other past performance records.



Review and revise the DOD source selection guide Table 5 confidence level descriptions. Further, consider whether neutral confidence makes sense for KBS. Limited and neutral confidence offers essentially have no real chance in a best value tradeoff given our findings. The marginal willingness to pay between these confidence levels and those with reasonable or high confidence is unrealistic.