Linear Performance Pricing: A Collaborative Tool for Focused Supply Cost Reduction

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Summary

Buyer supplier relationships are becoming increasingly important to effective supply chain management. For true win/win relationships to surface in an environment where there is constant pressure to reduce costs and still maintain reasonable profitability then trust, collaboration, and efficient sharing of information becomes critical. The use of across the board cost reduction demands and simple market clout may not always be the most effective approach in the long run. This paper describes linear performance pricing (LPP), a methodology developed by a major automobile OEM for leveraging their position relative to first and second tier suppliers in an attempt to effectively and efficiently provide focus to supplier cost reduction efforts. The approach should have wide practical appeal as it is fairly transparent and based upon simple regression analysis. It also has classroom applicability.

Key Words: Buyer Supplier relations, cost reduction, regression,

Educator & Practitioner Summary

This paper describes a regression based approach that buyers might use to focus supply cost reduction efforts. It assumes a collaborative effort on the part of both the buyer and supplier but has the potential for leveraging the position of the buyer with respect to tier one and two suppliers. It helps by focusing cost reduction efforts of the tier one suppliers and provides lateral market visibility they may not have otherwise.

Introduction

Managing the complex relationships between supply chain entities is a growing area of concern for most companies. As the challenges associated with developing the competencies necessary to support cross functional thinking within an organization are extrapolated outward toward those necessary to support cross organizational relationships, tools and activities used to approach yesterday and today's business problems must be revisited for tomorrow's challenges.

As technology supports the development of richer and more sophisticated relationships between supply chain entities, a firm's true competitive advantages and capabilities become obvious. Core competencies can be better exploited and non-core activities can be more easily outsourced. As a result, many industries, such as the automotive, consumer electronics, and mass merchandiser retail, to name a few, are sourcing a larger percentage of their revenue than ever. As they become more focused on the core activities by which they continue to add value (Fine, 2000), the leverage that supply base cost reductions have on overall OEM performance is enhanced.

Consider a typical firm spending 70% of revenue on purchased material from its suppliers. Assume the firm's Earnings Before Taxes (EBT) is 3% ($3 per $100 in revenue) (or 10% of the revenue not passed on directly on to its suppliers). If that same firm has a Price/Earnings (P/E) ratio of 25, then the market capitalization of the firm would be $75 per $100 in revenue. Should that firm take 2% out of its "spend" ($70/$100), it would generate another $1.40 directly to earnings. An enhanced EBT of 4.4% ($4.40 per $100 in revenue) would mean an improved market capitalization of $110 per $100 in revenue, a 46% increase. Table 1 describes the same analysis as the ratio of spend increases from 30% of a firm's revenue (typical of high value adding firms) to as much as 95% (typical of many fast moving and lean retail chains). The leverage of that same 2% decrease in spend is greatly enhanced as the proportion of spend increases.

****Insert Table 1 about here****

While coordination of material and information flow within exiting business relationships has been the focus of SCM to date, leveraging better understanding of supply partner capabilities and synergies in an attempt speed the develop of new and improved products has not developed as significantly. This paper will examine linear performance pricing (LPP), an approach taken by a major international auto manufacturer to use multiple regression analysis to competitively link tier one purchased component content and performance attributes to their cost drivers and subsequent tier two supplier component cost. LPP allows firms to better negotiate initial costs for components of new products as well as help focus efforts to negotiate reduced costs for currently sourced components.

Figure 1 illustrates a strategic taxonomy where suppliers are grouped by quality based metrics and cost based metrics. Arguably, tier one suppliers in the upper left quadrant (high on quality but not as cost effective as those in the upper right quadrant) need to find ways to improve their cost effectiveness. The approach described in this paper helps support that transition.

*********Insert Figure #1 about here*********

Figure #2 suggests that when considering the potential for cost reduction, the total cost of ownership be considered. Given that much of that cost is imbedded in the value purchased from tier one suppliers (who in turn purchase from tier two suppliers, etc), Figure #3 suggests the most potential for improvement may not exist within the value adding process of the OEM but at the tier one or tier two level.

*********Insert Figure #2 about here*********

*********Insert Figure #3 about here*********

The output of this approach can be used to identify areas for competitive understanding and improvement in the purchasing relationship between the OEM and tier one and tier two suppliers. Using the OEM's vantage point in the supply chain, supply cost reduction efforts can be more focused on situations where current costs are neither supported by the market place or component performance attributes

Linear Performance Pricing

Considering the analysis demonstrated in Table #1, this approach is based on an OEM that spends almost 80% of revenue on direct material in order to mass produce a variety of automobile product lines, many of which share common basic designs and many similar components. Many components (e.g. steering wheel, radiator, wheels, chassis, engines, transmissions, etc.) vary in terms of content, performance, and most of all cost. Using the graph in Figure #4 as an example, a commodity (e.g. steering wheels) may be sourced in a variety of models from 4 major suppliers (some of which may even be sole suppliers for a given model). When plotting the cost of each model against a content index (i.e., what they feel it should cost based upon drivers like diameter, strength, and complexity), a linear relationship becomes apparent with some steering wheels above and below the curve. By isolating those furthest below the curve, a second "best practice" curve can be estimated to demonstrate the potential for cost reduction.

*********Insert Figure #4 about here*********

Simply pressuring the ones above the curve for greater cost concessions may not be enough. In many cases tier one suppliers may be in a situation similar to the OEM in that they are sourcing an equally high percentage of their revenue from tier two suppliers. Like the OEM, this may limit the potential for cost reductions at that level. In many cases, significant potential for supply cost reduction may be at the second tier or below relative to the OEM.

In this paper, we describe LPP, a procedure developed to leverage a close working relationship with tier one vendors. It uses multiple regression techniques to identify opportunities for cost reduction at the tier two level. Buying many similar or related components from a variety of tier one suppliers puts the OEM in a position to compare component cost to the content index or performance attribute (size, capacity, features, strength, horsepower, etc.) that is most relevant to the costs driving its procurement cost. By working with tier one vendors across multiple models of each component type (e.g. wheel and axle assemblies for all the different cars that they make) they can identify many of the significant cost drivers those tier one suppliers face. The regression based approach suggested here allows the OEM to identify tier one prices that are not in line with other suppliers of the same type component and can help those tier one vendors identify cost improvement opportunities within their firm or more many times with tier two suppliers. In comparison to "across the board" demands for price reductions that the OEM might make based upon their own volume and market based clout, this approach supports a more focused approach that targets suppliers whose prices and underlying cost structures are not in line with the general market place and the level of content or performance attributes inherent in their offerings.

An Example

Figure #5 describes a hypothetical family of sub assemblies representative of those typically sourced by the OEM. Assume that a module comprised of four wheels, a front axle, and a rear axle is purchased from various tier one suppliers. They in turn source those subcomponents from a potentially wider set tier two suppliers. The modules are assembled and shipped to the OEM. Twenty models are sourced from a total of seven tier one suppliers. Table #2 lists the model, actual price, and volume for each of the 20 models.

*************Insert Figure #5 about here***********

***********Insert table #2 about here**********

In table #3, we list the cost of each wheel (4 per module) along with the three suggested cost drivers (weight, thickness, and volume- note that volume has a negative coefficient suggesting an economy of scale in sourcing that subcomponent) that discussions with both tier one and two suppliers suggest drive the cost of the wheels from the tier two suppliers. A regression analysis was performed and the results (Table #4) suggest a good fit and give us the coefficients to then derive a “should cost” for each wheel. A difference can be computed between the actual price and the “should cost” to find those wheels that appear to be priced above and below the market.

***********Insert table #3 about here**********

***********Insert table #4 about here**********

Tables #5-6 illustrate a similar analysis for the front axle assembly where actual prices are compared to a “should cost” derived from cost drivers of length, thickness, and volume. Tables #7-8 do the same thing for rear axle assemblies. As in the case of the wheels, deviations above and below the market can be approximated for both rear and front axles.

***********Insert table #5 about here**********

***********Insert table #6 about here**********

***********Insert table #7 about here**********

***********Insert table #8 about here**********

Table #9 combines the “should cost” of all the subcomponents, along with an estimated allowance for value added by the tier one supplier into an “expected price”. Clearly the “value add” estimate is a negotiated estimate of what would be a reasonable margin from which the tier one must cover all its other costs and still make a reasonable profit. We have hypothetically estimated it as a function of the supplier's gross margin (module price less direct subcomponent cost) and its volume (again implying an economy of scale). The resulting "expected price" can be compared to the actual price of the module. The results are shown in Figure #6. The modules whose actual prices are well under the market (Baker H, XYZ J, Northern O, and Confab P) can be graphed separately to describe what can be called "best practice". In other modules, potential for improvement can be estimated relative to the market and the best practice. In cases where the potential is quite large (Acme A-C, XYZ L, and XYZ K), the potential sources for cost improvement can be tracked back to subcomponent costs that were themselves well above the market estimate (Figure #7). IN revisiting the Sourcing Decision Matrix, Figure #8 shows those same modules in the upper left quadrant and suggests that while quality is likely to be high (in this hypothetical example, why else would they still a supplier?) there is a lot of room for improvement on cost metrics. This analysis simply helps add direction and focus to efforts to improve their costs.

***********Insert table #9 about here**********

*************Insert Figure #6 about here***********

*************Insert Figure #7 about here***********

*************Insert Figure #8 about here***********

What Is The Contribution Of Linear Performance Pricing?

The criteria necessary to implementing the approach described in this paper are becoming more and more common. In many contemporary SCM relationships, pressure for cost reduction is common. At the same time, many buyer/supplier relationships are moving beyond the adversarial mode of an arm's length relationship. Cooperation in sharing data and collaboration in product/component design is increasing thuds making the understanding of component and subcomponent cost drivers a more realistic possibility. Many OEMs source similar components for a family of end items that range across a content/performance index (i.e. "good, "better, and "best"). In those cases, LPP helps focus cost reduction efforts where the potential for such reduction is greatest. It gives the buyer a tool for placing their cost reduction pressure into the context of the market place as well as a relevant content/performance index.

References

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Table 1: Motivation to Reduce Cost of Purchased Material by 2%

Purchased Material as a % of Revenue	Incremental Value Added as a Percent of Revenue**	Earnings as a Percent of Revenue	Erngs*	Stock Price*	Savings after 2% cut in spend	Ernngs after *	Stock Price after *	Imprv.* (%)
90.00%	10.00%	1.00%	$1.00	$25	$1.80	$2.80	$70	180%
80.00%	20.00%	2.00%	$2.00	$50	$1.60	$3.60	$90	80%
70.00%	30.00%	3.00%	$3.00	$75	$1.40	$4.40	$110	47%
60.00%	40.00%	4.00%	$4.00	$100	$1.20	$5.20	$130	30%
50.00%	50.00%	5.00%	$5.00	$125	$1.00	$6.00	$150	20%
40.00%	60.00%	6.00%	$6.00	$150	$0.80	$6.80	$170	13%
30.00%	70.00%	7.00%	$7.00	$175	$0.60	$7.60	$190	8.6%
*per $100 in Revenue**Assumes earnings at 10% of incremental value added								

Table 2: Wheel Axle Module

Model	Actual Price	Volume
Acme A	$131.46	400
Acme B	$130.10	750
Acme C	$162.15	125
Baker D	$105.01	25
Baker E	$120.67	25
Baker F	$137.88	15
Baker G	$135.00	15
Baker H	$151.01	25
Baker I	$157.15	20
XYZ J	$110.52	125
XYZ K	$128.81	100
XYZ L	$143.11	***125***
Northern M	$105.87	500
Northern N	$121.00	375
Northern O	$121.83	300
ConFab P	$110.50	1250
MMS Q	$165.17	30
MMS R	$180.11	25
MMS S	$181.11	40
MMS T	$184.53	40

Table 3: What Wheels Should Cost

Model	Price	Weight (lbs)	Thickness (cm)	Volume	"Should Cost"	Difference
Acme A	$14.00	16.00	1.45	1600	$10.47	*$3.53*
Acme B	$14.23	17.00	2.00	3000	$10.79	*$3.44*
Acme C	$18.45	18.00	2.55	500	$14.42	*$4.03*
Baker D	$10.57	15.50	1.00	100	$10.66	-$0.09
Baker E	$12.01	16.75	1.50	100	$12.19	-$0.18
Baker F	$13.60	18.00	2.50	60	$14.70	-$1.10
Baker G	$14.32	19.25	2.75	60	$15.75	-$1.44
Baker H	$16.20	20.50	3.00	100	$16.77	-$0.57
Baker I	$15.09	21.75	1.75	80	$15.00	$0.08
XYZ J	$9.89	12.00	2.00	500	$10.59	-$0.70
XYZ K	$11.00	13.00	2.00	400	$11.14	-$0.14
XYZ L	$10.95	14.00	2.00	500	$11.52	-$0.57
Northern M	$8.27	12.75	1.75	2000	$9.19	-$0.92
Northern N	$9.22	15.00	1.75	1500	$10.66	-$1.44
Northern O	$9.68	16.00	1.75	1200	$11.38	-$1.70
ConFab P	$8.72	22.00	1.75	5000	$10.94	-$2.22
MMS Q	$17.88	31.00	1.00	120	$17.85	$0.03
MMS R	$19.35	34.00	1.50	100	$20.21	-$0.86
MMS S	$22.84	37.00	1.75	160	$22.03	$0.81
MMS T	$22.50	37.00	2.00	160	$22.50	*$0.00*

Table 4: Regression Statistics for Wheels

R Square	0.846877				
Adjusted R Square	0.818167				
Standard Error	1.890232				
Observations	20				
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	316.1775	105.3925	29.49712	9.37729E-07
Residual	16	57.16763	3.572977		
Total	19	373.3452			
	Coefficients	*Standard Error*	*t Stat*	*P-value*	
Intercept	1.646155	2.289877	0.718884	0.48258	
Weight	0.464877	0.056681	8.201569	4.01E-07	
Thickness	1.894526	0.861485	2.199139	0.042918	
Volume	-0.00085	0.000355	-2.39872	0.028993	

Table 5: What Front Axle Assemblies Should Cost

Model	Price	Length (cm)	Thickness (mm)	Volume	"Should Cost"	Difference
Acme A	$29.60	12.00	12.00	400	$29.01	$0.59
Acme B	$29.10	12.00	13.00	750	$29.40	-$0.30
Acme C	$35.25	14.00	14.00	125	$34.86	$0.39
Baker D	$29.05	14.00	8.00	25	$28.32	$0.73
Baker E	$32.45	14.00	12.00	25	$32.82	-$0.37
Baker F	$34.57	14.00	14.00	15	$35.10	-$0.53
Baker G	$32.57	15.00	10.00	15	$32.11	$0.46
Baker H	$37.05	15.00	15.00	25	$37.71	-$0.66
Baker I	$41.16	15.00	19.00	20	$42.23	-$1.07
XYZ J	$31.05	12.00	13.00	125	$30.71	$0.34
XYZ K	$35.20	14.00	14.00	100	$34.92	$0.28
XYZ L	*$46.15*	*15.00*	*20.00*	*125*	*$43.13*	$3.02
Northern M	$33.65	15.50	11.00	500	$32.97	$0.68
Northern N	$34.75	16.00	12.00	375	$35.12	-$0.37
Northern O	$36.85	16.50	13.00	300	$37.16	-$0.31
ConFab P	$32.10	14.00	14.00	1250	$32.50	-$0.40
MMS Q	$36.44	14.00	16.00	30	$37.32	-$0.88
MMS R	$39.05	14.00	18.00	25	$39.58	-$0.53
MMS S	$34.52	14.00	14.00	40	$35.04	-$0.52
MMS T	$35.62	14.00	15.00	40	$36.17	$0.55

Table 6: Regression Statistics for Front Axle Assemblies

R Square	0.9537104				
Adjusted R Square	0.9450311				
Standard Error	0.9714855				
Observations	20				
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	311.1186	103.7062112	109.8834	6.89E-11
Residual	16	15.10055	0.943784152		
Total	19	326.2192			
	Coefficients	*Standard Error*	*t Stat*	*P-value*	
Intercept	-1.828478	2.838074	-0.644267183	**0.528531**	
Length	1.5140756	0.186669	8.111002248	**4.64E-07**	
Thickness	1.1256255	0.078312	14.37353734	**1.45E-10**	
Volume	-0.002099	0.000719	-2.91853934	0.010047	

Table 7: What Rear Axle Assemblies Should Cost

Model	Price	Length (cm)	Thickness (mm)	Volume	"Should Cost"	Difference
Acme A	$35.00	25.00	12.00	400	$35.51	-$0.51
Acme B	$34.30	25.00	13.00	750	$35.01	-$0.71
Acme C	$38.70	25.00	14.00	125	$38.15	$0.55
Baker D	$24.20	16.00	8.00	25	$23.90	$0.30
Baker E	$29.30	18.00	12.00	25	$29.30	$0.00
Baker F	$33.04	20.00	14.00	15	$33.12	-$0.08
Baker G	$30.34	20.00	10.00	15	$29.90	$0.44
Baker H	$35.50	22.00	15.00	25	$36.07	-$0.57
Baker I	$41.42	24.00	19.00	20	$41.48	-$0.06
XYZ J	$30.20	19.00	13.00	125	$30.82	-$0.62
XYZ K	$38.17	19.00	14.00	100	$31.72	$6.45
XYZ L	$37.10	19.00	20.00	125	$36.46	$0.64
Northern M	$30.90	22.00	11.00	500	$31.07	-$0.17
Northern N	$34.80	24.00	12.00	375	$34.51	$0.29
Northern O	$36.00	24.00	13.00	300	$35.60	$0.40
ConFab P	$33.30	24.00	14.00	1250	$32.85	$0.45
MMS Q	$42.28	27.00	16.00	30	$42.29	-$0.01
MMS R	$43.40	27.00	18.00	25	$43.92	-$0.52
MMS S	$40.54	27.00	14.00	40	$40.64	-$0.10
MMS T	$42.24	27.00	15.00	40	$41.45	$0.79

Table 8: Regression Statistics for Rear Axle Assemblies

R Square	0.991755				
Adjusted R Square	0.990209				
Standard Error	0.507048				
Observations	20				
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	494.8108	164.9369216	641.5353	7.1E-17
Residual	16	4.113555	0.257097203		
Total	19	498.9243			
	Coefficients	*Standard Error*	*t Stat*	*P-value*	
Intercept	0.157261	0.836351	0.188032112	0.853216	
X Variable 1	1.087058	0.038286	28.39301105	4.08E-15	
X Variable 2	0.805786	0.044815	17.98036094	4.91E-12	
X Variable 3	-0.00374	0.000388	-9.640530966	4.56E-08	

Table 9: Actual, Component, And Expected Price

Model	Actual Price	Wheel Asmbly	Front Axle Asmbly	Rear Axle Asmbly	Value Add*	Expected Price**	Difference***
Acme A	$131.46	$41.88	29.01	35.51	$8.64	$115.04	$16.42
Acme B	$130.10	$43.15	29.40	35.01	$7.01	$114.56	$15.55
Acme C	$162.15	$57.68	34.86	38.15	$12.44	$143.14	$19.01
Baker D	$105.01	$42.64	28.32	23.90	$9.36	$104.23	$0.78
Baker E	$120.67	$48.76	32.82	29.30	$10.96	$121.85	-$1.17
Baker F	$137.88	$58.80	35.10	33.12	$12.63	$139.64	-$1.76
Baker G	$135.00	$63.02	32.11	29.90	$12.43	$137.45	-$2.45
Baker H	$151.01	$67.10	37.71	36.07	$13.96	$154.84	-$3.83
Baker I	$157.15	$60.02	42.23	41.48	$14.27	$158.00	-$0.85
XYZ J	$110.52	$42.35	30.71	30.82	$9.76	$113.65	-$3.13
XYZ K	$128.81	$44.55	34.92	31.72	$10.62	$121.81	$7.00
XYZ L	$143.11	$46.07	43.13	36.46	$11.94	$137.61	$5.50
Northern M	$105.87	$36.75	32.97	31.07	$7.58	$108.37	-$2.50
Northern N	$121.00	$42.64	35.12	34.51	$9.35	$121.62	-$0.62
Northern O	$121.83	$45.52	37.16	35.60	$10.33	$128.60	-$6.77
ConFab P	$110.50	$43.74	32.50	32.85	$4.66	$113.76	-$3.26
MMS Q	$165.17	$71.40	37.32	42.29	$14.95	$165.95	-$0.78
MMS R	$180.11	$80.83	39.58	43.92	$16.31	$180.64	-$0.53
MMS S	$181.11	$88.10	35.04	40.64	$16.18	$179.97	$1.14
MMS T	$184.53	$90.00	36.17	41.45	$16.56	$184.17	$0.35

*Estimate based upon 10% of material costs less .005*volume
** Sum of component “should costs” + value add
*** Actual price – expected price

Figure 1: Sourcing Decision Matrix

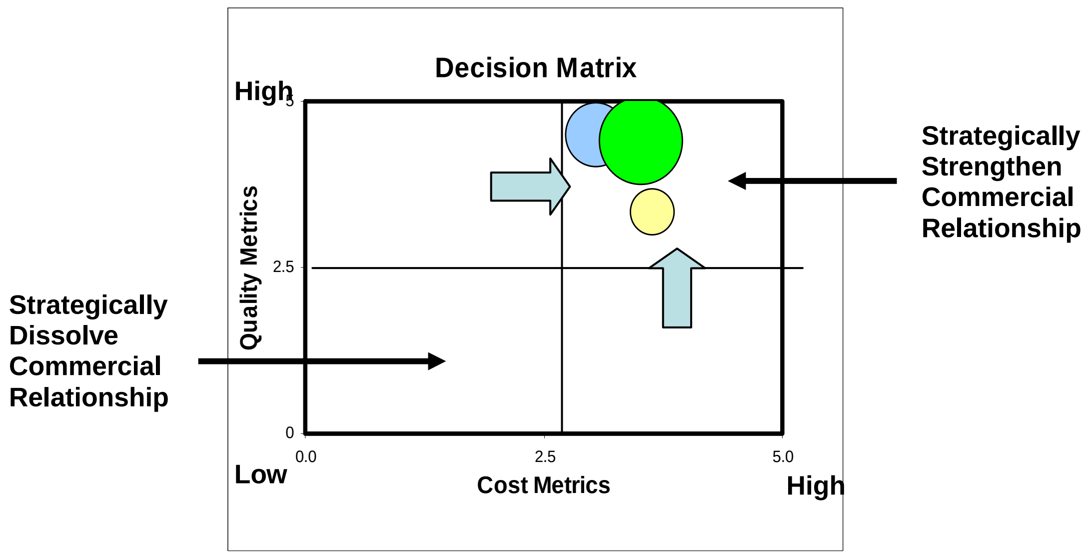

Figure 2: Where is the Potential for Cost Reduction?

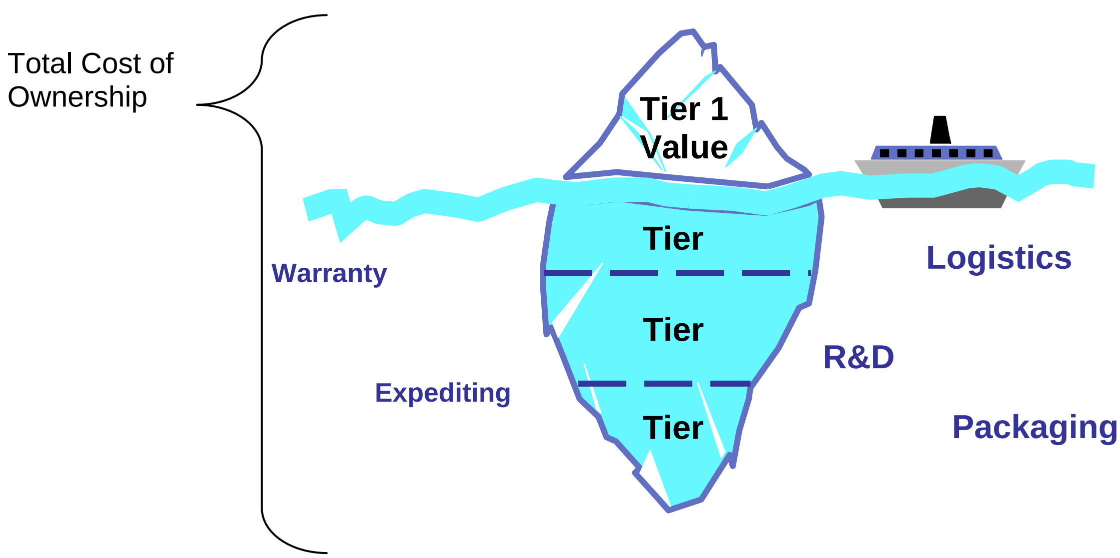

Figure 3: Breakout of Potential for Cost Reduction?

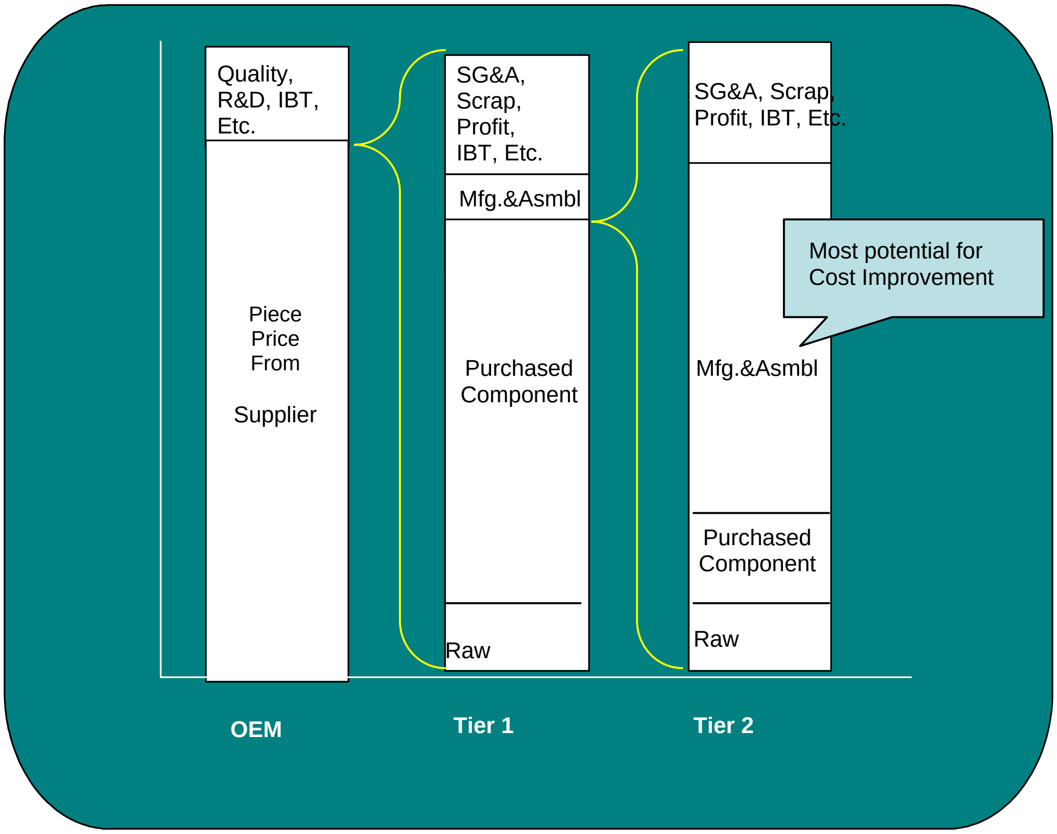

Figure 4: Linear Performance Pricing

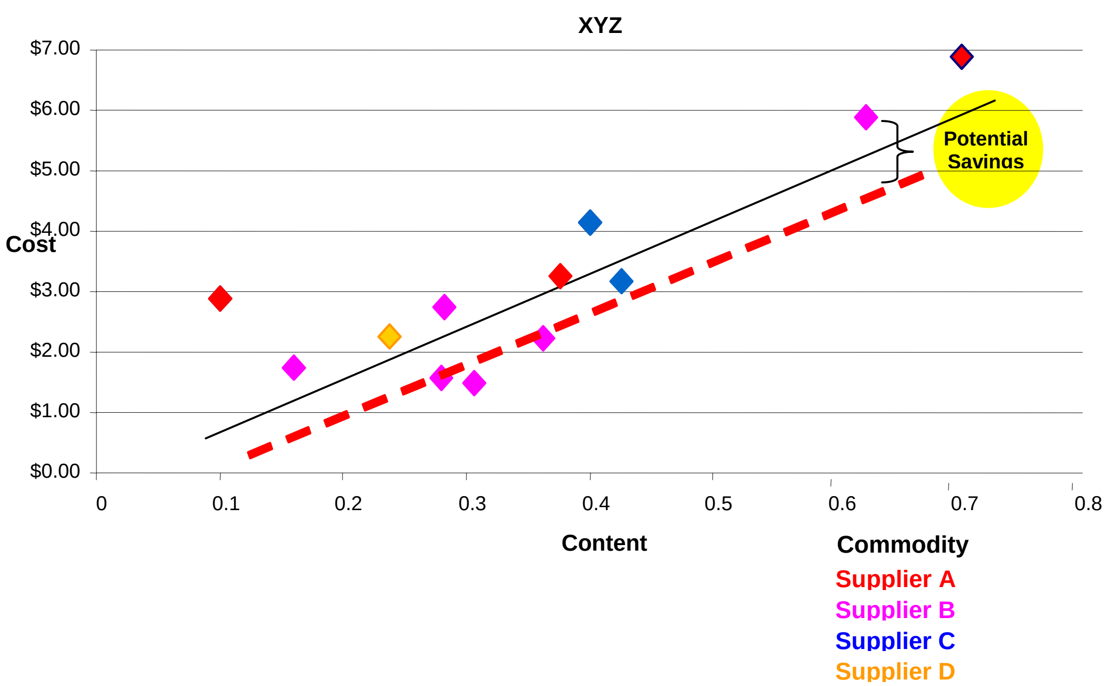

Figure 5: Wheel/Axle Modules:

- 4 Wheel Assemblies
- 1 Front Axle Assembly
- 1 Rear Axle Assembly

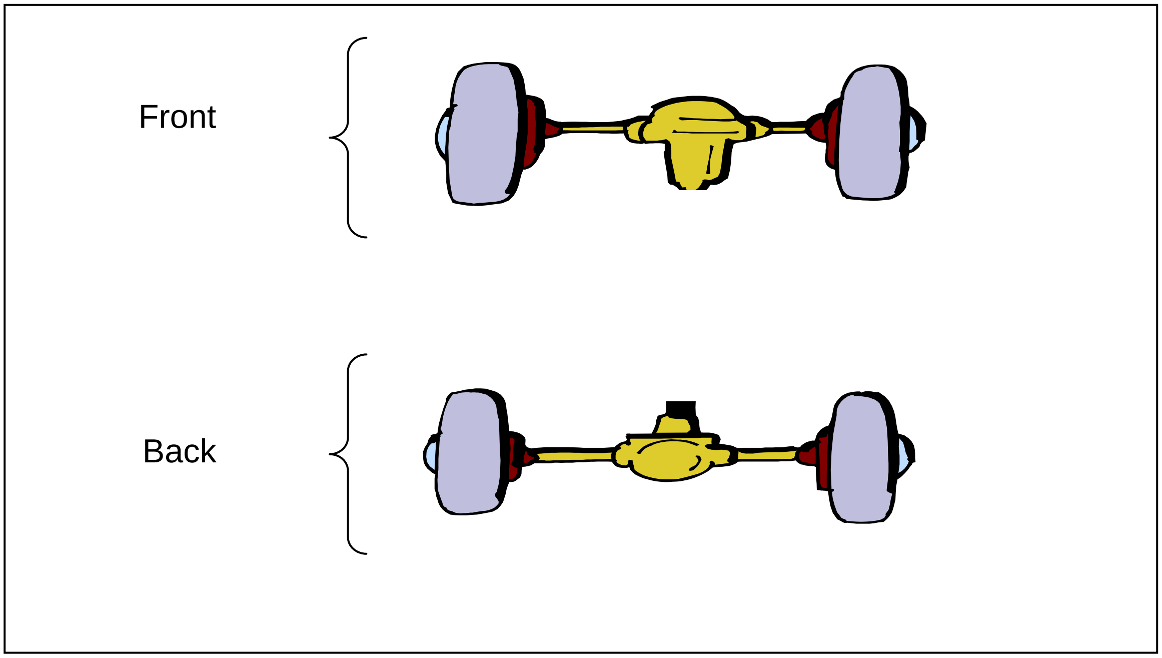

Figure 6: Now We Have Some Insights into Why Some Are Above The Trend Lines for the Market and Best Practice…..

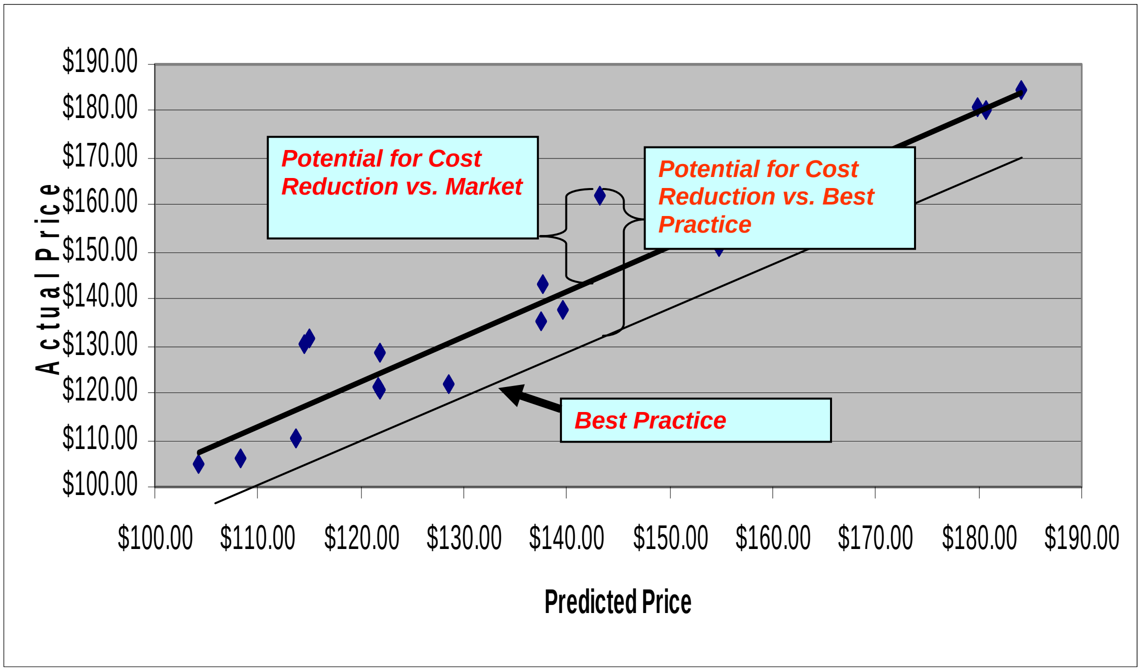

Figure 7: Where The Potential May

What Wheels "Should"

Model	Price	Length	Diameter	Volume	"Should Cost"	Difference
Acme A	$14.00	16.00	1.45	1600	$10.47	$3.53
Acme B	$14.23	17.00	2.00	3000	$10.79	$3.44
Acme C	$18.45	18.00	2.55	500	$14.42	$4.03
.	.	.	.	.	.	.

What Fronts "Should"

Model	Price	Depth	Thickness (Mm)	Volume	"Should Cost"	Difference
XYZ L	$46.15	15.00	20.00	125	$43.13	$3.02
.	.	.	.	.	.	.

What Rears "Should"

Model	Price	Height	Thickness (Mm)	Volume	"Should Cost"	Difference
XYZ K	$38.17	19.00	14.00	100	$31.72	$6.45
.	.	.	.	.	.	.

Figure 8: Sourcing Decision Matrix Revisited