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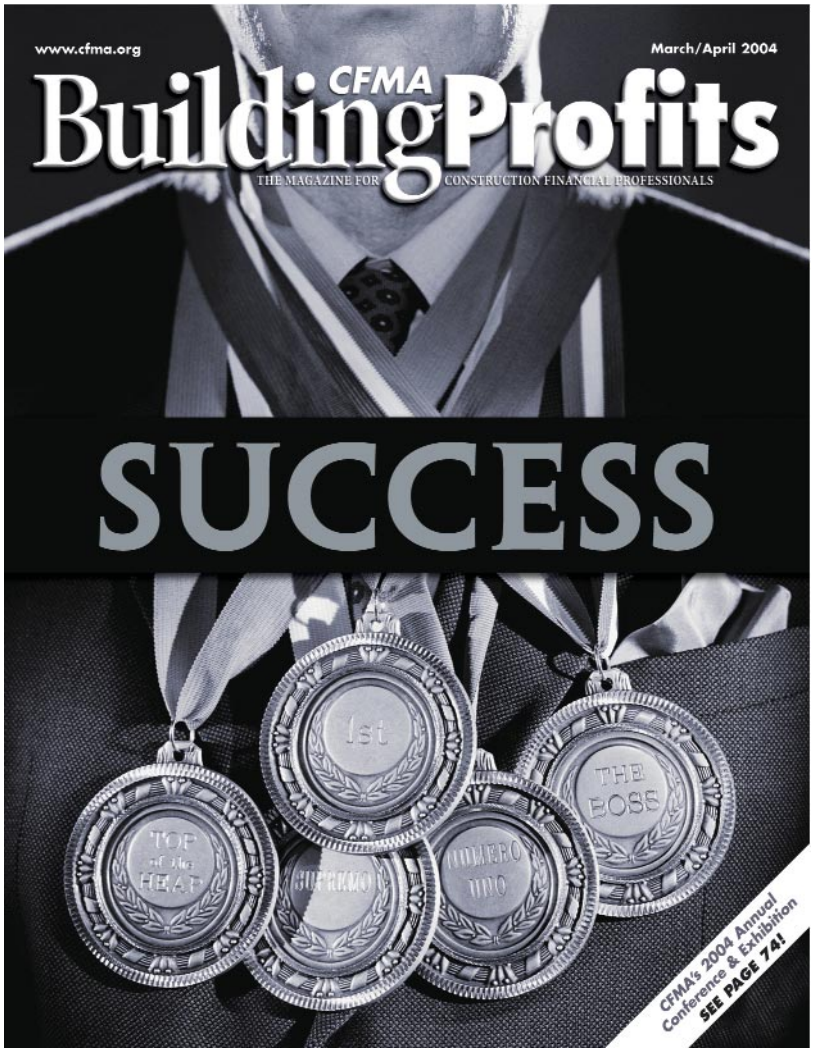

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The Source & Resource for Construction Financial Professionals

USING BENCHMARKS & METRICS TO BECOME A

"BEST IN CLASS" CONTRACTOR

BY RICHARD L. WERNER

As we all become more dependent on IT, the amount of data being added to our systems increases exponentially – often with unintended, problematic consequences.

For example, much of the data output from our systems is poorly presented and of little value. In addition, the volume of output is so great that it obscures the useful information we need to effectively run our businesses.

When discussing your company's information systems, have you heard, or perhaps even uttered, any of the following phrases?

- "Information buried in a sea of noise"
- "Drowning in data"
- "Prison of information"

If you answered "Yes," you are not alone. And, to make matters worse, experts estimate that 10-30% of the data flowing through corporate systems is flawed.

In a recent data integrity study, the Data Warehousing Institute (DWI) found that nearly half the companies surveyed suffered costs due to poor data.[1] In fact, the estimated annual costs caused by defective data for U.S. businesses is more than $600 billion a year – roughly equal to all of the non-residential construction put in place in the U.S. in 2003.

According to the DWI study, " . . . executives are oblivious to the data quality lacerations that are slowly bleeding their companies to death. More injurious than the unnecessary printing, postage, and staffing costs is the slow but steady erosion of an organization's credibility among customers and suppliers, as well as its inability to make sound decisions based on accurate information."

Nonresidential (I&N), Heavy & Highway (H&H), and Specialty Trades (ST). Exhibit 1 shows a financial snapshot of these three segments abstracted from *CFMA's 2003 Construction Industry Annual Financial Survey*. Except as indicated, all information in the exhibit is shown as a percentage of Annual Revenue.

EXHIBIT 1

FINANCIAL CHARACTERISTICS OF CONSTRUCTION CONTRACTORS BY INDUSTRY SEGMENT*

		TYPE OF CONTRACTOR						
		INDUSTRIAL & NONRESIDENTIAL		HEAVY & HIGHWAY		SPECIALTY TRADE		
METRIC NUMBER	METRIC	ALL PARTICIPANTS (256)	BEST IN CLASS (83)	ALL PARTICIPANTS (123)	BEST IN CLASS (17)	ALL PARTICIPANTS (179)	BEST IN CLASS (37)	PRIME FOCUS OF
1	Annual Revenue (millions) (rounded)	119	193	70	109	53	48	
2	Annual Revenue (%)	100.0	100.0	100.0	100.0	100.0	100.0	
3	Cost of Construction (%)	94.3	94.4	89.1	88.8	84.8	81.4	
4	Gross Margin (%)	5.7	5.6	10.9	11.2	15.2	18.6	Project Managers
5	SG&A Expense (%)	4.3	3.6	6.9	5.2	12.6	12.2	
6	Income from Operations (%)	1.4	2.0	4.0	6.0	2.6	6.4	CFO
7	Net Income (%)	1.4	2.0	3.2	4.6	1.5	6.0	
8	Net Worth (%)	6.5	6.8	18.5	12.1	14.0	11.7	
9	Return on Net Worth (ROE) (%)	21.0	28.9	17.3	37.7	10.4	51.4	Owners
10	Assets (%)	29.5	28.1	42.7	29.7	38.0	29.7	
11	Return on Assets (%)	4.6	7.0	7.5	15.3	3.8	20.3	CFO
12	Labor Costs (% of Total Costs)†	10-20		40-60		50-80		
13	Technology Costs (%)	0.1	0.2	0.2	0.1	0.3	0.2	

* From *CFMA's 2003 Construction Industry Annual Financial Survey*. For specific information, see pages 122, 166, and 219 of this survey. Except as indicated, all information is shown as a percentage of Annual Revenue.

† Based on Shaker's experience and research.

This article proposes a remedy to the "data overload" problem. It will present key construction industry metrics, demonstrate how the values of those metrics directly relate to company performance, show what is needed to produce those metrics, and suggest a meaningful and useful presentation of this information for construction company owners, CFMs, and project managers.

Is Becoming a "Best in Class" Construction Company Worthwhile?

To answer this question, let's first examine the construction industry's financial characteristics. Although construction is not a uniform industry, there is a great deal of similarity between the metrics of Best in Class (BiC) companies within certain industry segments. These segments (excluding homebuilders) are typically categorized as: Industrial &

Information is included for All Participants and BiC participants by construction segment. BiC respondents include contractors in the top quartile based on four metrics: Return on Assets, Return on Equity, Days in A/R, and Fixed Asset Ratio.

What the Numbers Show

A number of observations can be drawn from Exhibit 1:

1) Gross Margin and Net Income as a percentage of Annual Revenue vary significantly between industry segments.

2) Income from Operations as a percentage of Net Worth (ROE) is much higher than Income from Operations as a percentage of Annual Revenue. This seems appropriate considering the nature of the risks involved in the industry.

3) In most cases, financial characteristics are equal to or significantly better for BiC respondents than for All Participants.

4) When examining All Participants, there is a large variation between construction segments in terms of Income from Operations as a percentage of Annual Revenue.

5) The variation in Income from Operations percentages between construction segments is magnified when examining only BiC respondents (I&N compared to H&H or ST).

6) The percentage of the increase in Gross Margin percentages for BiC respondents compared to All Participants varies considerably between construction segments.

7) The percentage of increase in Income from Operations for BiC respondents compared to All Participants is more dramatic than the corresponding increase in Gross Margin percentages.

8) BiC respondents in all construction segments have lower SG&A Expense as a percentage of Annual Revenue than do All Participants.

9) Much to this writer's surprise, reduced SG&A costs accounted for most of the improved performance of BiC, I&N, and H&H participants.

This does not diminish the need to manage the Cost of Construction, which accounts for approximately 89-94% of total costs for I&N and H&H participants.

As expected, reduced Cost of Construction accounted for most of the improved performance of BiC Specialty Trade participants.

10) The improved financial characteristics associated with BiC respondents are independent of contractor size.

11) Labor Costs, as a percentage of total costs, vary dramatically by construction segment.

The Value of Being A "Best in Class" Contractor

Consider this: On the whole (and depending on construction segment), BiC respondents earned more (sometimes significantly more) than their "average" counterparts. Because of this, these companies also enjoyed the improved customer, supplier, and employee relationships that typically accompany such financial success.

Understanding the financial characteristics of BiC companies will help contractors see how they are doing in comparison to their construction segment. For example, a Gross Margin of 6% may be satisfactory in one construction segment and not in another, while controlling labor costs is critical in some segments and not in others.

Gross Margin %

This article emphasizes metrics that impact Gross Margin %, defined as: [(Revenue – Cost of Construction) ÷ Revenue] x 100.

Items such as SG&A expenses, while very important and requiring effective management, are outside the scope of this article.

Data Relevant to Construction

To determine what data is most relevant to the construction industry, the Construction Industry Institute (CII) has examined over 1,000 projects since it was established in 1983.

CII is a consortium of leading owners, contractors, and suppliers who have joined with academia to find better ways of planning and executing capital construction programs. Based on its studies, CII has identified the core practices that are the essence of all construction firms. These core practices are listed alphabetically in Exhibit 2, together with their impact on project cost savings and schedule reduction.

EXHIBIT 2

CORE CONSTRUCTION PRACTICES*

PRACTICE	BENEFICIAL IMPACT OF PRACTICE USE ON: COST SAVINGS	SCHEDULE REDUCTION
Change Management	High	Medium
Constructability	Medium to High	Medium to High
Materials Management	Low to Medium	High
Planning for Startup	Low	Medium
Pre-Project Planning	Medium	Medium
Quality Management	Insufficient Data	Insufficient Data
Team Building	Medium	Medium to High
Technology Automation/Integration	Low to Medium	Low to Medium
Zero-Accident Techniques	Medium to High	Low

* From *Benchmarking & Metrics Value of Best Practices Report*, February 2003, Construction Industry Institute, Benchmarking and Metrics Committee.

Practice Use Index

CII created a questionnaire to rate each of these practices individually, as well as a "Practice Use Index" that combines ratings for the separate practices into a single measure of practice utilization.[2]

According to their findings, the better the combined practice utilization, the higher the Practice Use Index. For construction firms, the Practice Use Index has been found to

correlate positively to the Project Performance Metrics described in Exhibit 3 on the next page.

Almost without exception, CII's studies showed that cost, schedule, and safety performance (as measured by the metrics shown in Exhibit 3) improve as practice utilization improves. The cost saving, schedule reduction, and safety improvement impacts of adhering to the practices shown on Exhibit 2 demonstrate this.

The findings also indicate that it's better to use a single standard Practice Use Index (that combines available practice use scores for all nine practices shown in Exhibit 2) than to use multiple indices based on individual practices.

Doing so will reveal more consistent relationships between practice use and performance, and will better reflect the reality of practice use in the project environment.

Note: While cost reductions generally increase when a single standard Practice Use Index is used, schedule growth almost always follows.

This indicates that, normally, cost and schedule performance cannot be managed in order to maximize cost and schedule reductions simultaneously. Typically, costs are managed at the expense of schedules.

What the Numbers Show

While all of this is interesting and increases our understanding of what makes construction operations successful, how does it relate to benchmarks, metrics, and the "data overload" problem that began this article?

Here's the answer: While there is a strong correlation between the use of the core practices shown in Exhibit 2 and project performance as measured by the metrics in Exhibit 3, the corollary is also true – *If the metrics are good, the procedures behind them will also be good.*

By continually monitoring the proper metrics, construction companies will also be indirectly monitoring their procedures. In addition, these same metrics can be used to make comparisons with other comparable and BiC companies.

That is not to say that the core practices themselves should not be continually monitored and improved. They should be, since they are the reason for the performance experienced. The metrics discussed in the remainder of this article are the easily measured result of those practices.

Important Construction Industry Metrics

There is a significant financial advantage to becoming a BiC construction company. To demonstrate this, and to show the metrics that are used to measure construction company performance, let's discuss how to use the type of historical information presented thus far to assist with proactively managing projects in process.

To do this, we will focus on the information required to contribute to the management process – not on computers, forms, charts, or systems. (Nor will we deal with Payroll, A/P, A/R, or other internal systems, on the assumption that all such systems are properly in place.) What is important, as you will see, is *the proper integration and handling of information input from many subsystems, and the ability to compare the distilled information to a standard.*

. . . EFFECTIVE MANAGEMENT
OF EACH PROJECT'S **GROSS MARGIN** . . .
REQUIRES THE ABILITY TO
ACCURATELY CAPTURE & UTILIZE
TWO PIECES OF INFORMATION
ON A **TIMELY BASIS . . .**
REVISED BUDGET/CONTRACT
& FORECAST COSTS.

The Key to Proactive Management

In construction, project managers are frequently watchers rather than managers. They respond to events as they occur, but don't have control over either what is happening or what is going to happen.

One reason for this is that they don't have the right kind and amount of information in the right place at the right time. More often than not, the information is available, but it is so voluminous and in such poor form that it is not useful in a practical way.

In order to be of value, *information must be presented in a concise and readable way so that it can be used proactively to impact a project's future,* rather than just as historical information of no useful value.

The key to proactive financial and project management is the effective management of each project's Gross Margin. This requires the ability to accurately capture and utilize two pieces of information on a timely basis, in addition to the mandated information of costs, commitments, hours, and quantities. For the purposes of this article, these two pieces of information are the Revised Budget/Contract and Forecast Costs.

Terminology & the Importance of Accuracy

The terms Revised Budget and Forecast are defined in Exhibit 4 , as are the closely related terms, Estimated Cost at Completion and Variance, that are derived from them. In order for meaningful information to be produced for use by project managers, these definitions must be adhered to

EXHIBIT 3

CONSTRUCTION PROJECT PERFORMANCE INDICES USED BY CII*

PROJECT PERFORMANCE METRIC	METRIC CLASS	PROJECT PERFORMANCE METRIC NAME	DEFINITION
1	Cost	Budget Factor	Total Project Cost/ Revised Budgeted Costs
2	Schedule	Schedule Factor	Total Project Duration/ Revised Project Duration
3	Safety	Recordable Incident Rate	(Total Number of Recordable Cases x 200,000)/ Total Site Work Hours
4	Safety	Lost Workday Case Incident Rate	(Total Number of Lost Workday Cases x 200,000)/ Total Site Work Hours

* From *Benchmarking & Metrics Value of Best Practices Report*, February 2003, Construction Industry Institute, Benchmarking and Metrics Committee.

rigorously, and change processing must be performed on a timely basis.

(Note: Change management also falls outside the scope of this article. For further information on this topic, see my article, "Fundamentals of Change Management for Construction and Project Management Professionals," in the May/June 2002 issue of this magazine.)

Being able to accurately capture and derive the information defined in Exhibit 4 enables the production of many metrics, including the five important Project Performance Metrics that can be used for contemporaneous project management, as shown in Exhibit 5 on the next page.

The BiC values furnished in Exhibit 5 have been gathered from data supplied from various CII and CFMA publications, and my own experience. The values shown may be used as a rough guide and as a starting point, but all contractors should derive their own standards based on their specific situation.

The Presentation of Information

We have shown that while not much information is required to monitor project performance, the information must be accurate, timely, and carefully defined. Once this is done, the project performance information can be automatically generated and presented in a single view, as shown in Exhibit 6 on the next page.

The presentation of project metrics should meet the following criteria:

1) Be user-configurable, allowing the user to determine both the appearance and arrangement of the columns.

2) Enable the user to sort and filter the data presented and easily export the resulting data to a spreadsheet.

3) Enable the user to drill down (or dig deeper) to other views to determine why the values are what they are.

4) Be time-sensitive, so that trends can be presented and data examined for prior periods.

A Sample Presentation

The information presented in Exhibit 6 is for a set of 8 jobs for a Specialty Trade contractor, but it could just as easily be for 20,000 jobs for an H&H or I&N Contractor. It does not include any cost, commitment, billing, payables, or receivables information.

However, the information presented is derived using such data and shows the user enough information to get a sense of the job and other normalized information (such as, percentages) that can be compared to standards and other similar jobs.

Look at the Totals in Exhibit 6 for the set of jobs shown:

1) Col. 5 shows that, in total, the jobs are 82.2% complete.

2) Comparing Col. 9 to Col. 8 shows that, in the aggregate,

EXHIBIT 4

BUDGET, ESTIMATED COST AT COMPLETION(ECAC), AND VARIANCE DEFINITIONS

BUDGET
- Revised Budget (RB) = Original Budget(OB) + Budget Rearrangements (BR) + Change Orders (CO)

ECAC
- Forecast (F) = Project Manager's Forecast (PMF)
- Computer Calculated Cost Projection (CCCP) = Computer's Forecast (CF)
- Estimated Cost at Completion (ECAC) = f [Forecast (F) + Computer Calculated Cost Projection (CCCP)]

VARIANCE
- Projected Cost Variance (PCV) = Estimated Cost at Completion (ECAC) – Revised Budget (RB)

the Revised Budgeted Margin % (RBM %) value of 25 is greater than the Original Budgeted Margin % (OBM %) value of 23.88, thus indicating positive change order effectiveness.

The Change Order Effectiveness Index (COEI) of 1.05 (Col. 17) compares favorably to the corresponding metric for the BiC companies shown in Exhibit 5.

EXHIBIT 5

IMPORTANT PROJECT PERFORMANCE METRICS

METRIC NO.	METRIC	CALCULATION	TYPICAL BEST IN CLASS
1	Cost Variances (% of Revised Budget)	[(Estimated Cost at Completion – Revised Budget) /Revised Budget] x 100	-5
2	Overbillings (% of Revenue)	[(Billings – Revenue) /Revenue] x 100	3 I&N 4 H&H 5 ST
3	Underbillings (% of Revenue)	[(Billings – Revenue) /Revenue] x 100	1 I&N 4 H&H 3 ST
4	Cash Flow (% of Gross Margin)	[(Cash Receipts – Cash Disbursements) /Gross Margin] x 100	100 I&N 100 H&H 50 ST
5	Change Order Effectiveness Index	Revised Budgeted Margin /Original Budgeted Margin	1.05

3) Comparing Col. 9 to Col. 10 shows that, in the aggregate, there is some Margin % fade (an RBM % value of 25 compared to an EMAC % value of 19.80).

Even with this, these values compare favorably to the BiC Gross Margin % value of 18.6% shown on Exhibit 1 for BiC Specialty Trade contractors.

4) In Col. 13, the Projected Total Cost Variance % (PTCV%) value of 6.93 compares unfavorably to the BiC value of -5% in Exhibit 5. This indicates unfavorable cost overruns in comparison to the Revised Budget.

5) Both Col. 14 and 15 show that Overbillings significantly exceed Underbillings by a ratio of 21.15, exceeding the ratio of 1.67 (5/3) for BiC Specialty Trade contractors shown in Exhibit 5. Overbillings are 4.3% of revenue, Underbillings are 0.2% of Revenue compared to respective BiC values of 5 and 3 shown in Exhibit 5. Both metrics are very positive.

6) Comparing Col. 16 to Col. 7 shows that Cash Flow is 63% of Gross Margin. This compares favorably to the 50% metric shown on Exhibit 5 for BiC Specialty Trade contractors.

EXHIBIT 6

PRESENTATION OF JOB PERFORMANCE METRICS IN A SINGLE VIEW

File Edit Records Function Other Tasks Window Help

Job Status - Argon 1/1

Save All One Add Cancel Other Tasks

Job Name	Contract Amount	Revised Budget	ECAC	$ % Complete	Revenue	Margin $	OBM %	RBM %	EMAC %	PTMV %	PTCV $	PTCV %	Over Billings	Under Billings	Cash Flow	CO...	Margin $ This Month	PTCV $ This Month
EURAND AMERICA CP-6	817,713	865,596	644,480	99.6772	794,655	152,256	15.20	18.60	21.18	13.88	-21,116	-3.17	19,795	0	172,051	1.22	0	-21,115
AT&T XENIA A.H. UNIT	396,611	301,046	341,076	97.3325	396,611	64,633	15.63	24.10	14.00	-41.89	40,030	13.30	0	0	94,425	1.54	-5,136	40,030
CHILDRENS MEDICAL CENTER	286,481	212,478	242,682	94.2764	270,084	41,292	25.94	25.83	15.29	-40.82	30,204	14.22	10,896	0	15,980	1.00	-14,869	30,194
FARMINGTON HILLS CORP CA...	2,209,929	1,513,568	1,753,594	99.1355	2,191,671	453,238	31.19	31.51	20.65	-34.47	240,026	15.86	18,258	0	471,496	1.01	834	240,015
RECTICEL AUTOMOTIVE	578,200	464,495	456,589	72.9273	426,895	93,917	19.66	19.66	21.03	6.95	-7,906	-1.70	89,195	0	-141,837	1.00	41,164	-37,715
MOTOR CITY ELEC	778,000	613,533	612,410	21.3614	157,614	26,794	21.14	21.14	21.28	0.68	-1,123	-0.18	62,106	0	-36,600	1.00	14,453	-1,697
OAKLAND SCHOOLS/CENTER	380,257	301,691	321,286	94.1857	380,257	77,651	19.80	20.66	15.51	-24.94	19,595	6.50	0	0	42,706	1.04	-5,257	19,595
MT. CLEMENS SEMINOLE ELE...	233,168	188,070	183,634	20.4967	46,468	8,829	19.34	19.34	21.24	9.84	-4,436	-2.36	0	9,468	-36,898	1.00	175	-4,436
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Totals	5,680,359	4,260,477	4,555,750	82.2180	4,664,255	918,610	23.88	25.00	19.80	-20.80	295,273	6.93	200,251	9,468	581,323	1.05	31,364	264,871

Columns: JOB PERFORMANCE METRICS
Filter: JOB GROUP JMJ

Inquiry 02/26/2004 <MASTER>

ABBREVIATIONS:

COEI = Change Order Effectiveness Index
ECAC = Estimated Cost at Completion
EMAC = Estimated Margin at Completion
OBM = Original Budgeted Margin
RBM = Revised Budgeted Margin
PTCV = Projected Total Cost Variance
PTMV = Projected Total Margin Variance

7) Col. 19 shows that for all month-ending dates, there was a budget overrun of $264,871. This is a very unfavorable indicator, because of its magnitude (90% of the projected total overrun for all jobs listed, Col. 12).

A quick review of Exhibit 6 shows that a single job is responsible for $240,015 of the $264,871 monthly overrun. By drilling down into that job with a click of the mouse, the backup details can be immediately obtained and the problem quickly identified by variance analysis, such as incurred costs to budgeted costs. (For more information on this, see my article "Cost Projections by Computer," in the September/October 1993 issue of this magazine.)

By doing such an analysis, underperforming and unusual performing jobs stand out; as well, jobs for which data is not being correctly collected will become more readily apparent.

In general, the metrics for the jobs shown in Exhibit 6 meet or exceed BiC metrics, which indicates that these jobs have been bid/negotiated and executed using best practices.

Filters

In addition to reviewing a set of jobs, each job should be examined individually. When many jobs are involved, one effective means is to use a filter to select the job set.

A typical filter might be as follows: "All jobs that are underbilled, with a projected total cost variance of more than $50,000, with a negative cash flow, and with a change order effectiveness index of less than 1." You would hope to get a null set for such criteria, but you get the idea.

A Word About "Business Intelligence"

Business Intelligence is *the process of integrating core information with relevant contextual information to detect significant events and illuminate cloudy issues*.

This information should be presented in a format that is immediately ready for easy analysis without reconstitution; such information is frequently derived from data warehouses, data marts, data mines, decision support systems, online analytical processors, and other software applications. The process of adding these systems to an existing application can be expensive and often requires a significant amount of work to implement and operate.

Before going that route, the possibility of using an existing system's "Embedded Business Intelligence" functionality should be investigated. Your software supplier can help you with this.

Final Words

While the construction industry is more complex than most, the core metrics needed to measure and monitor performance at the project level can be consolidated and presented in a very useful format. Research has identified the values of these metrics for BiC companies in the three primary construction segments.

To a large degree, a project's Gross Margin percentage is established at Contract Award, before construction has even started. That being the case, all that can be expected is to optimize the work within the constraints of the contract.

This fact does not diminish the value of using the metrics presented for project management; in fact, it accentuates their value, particularly if the project metrics are not favorable. Item 3 in " The Presentation of Information" section refers to the drill down/dig deeper functionality that facilitates project management at the work breakdown and work category level. Cost Variance (metric 1 of Exhibit 5) is the primary metric to use for monitoring and managing performance below the project level. BP

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Endnotes

1. Goff, John, Senior Editor. "Drowning in Data," *CFO Magazine*, November 2003.
2. The CII Benchmarking & Metrics Program, Construction Industry Institute, *http://www.cii-benchmarking.org/downloads.cfm*. Last accessed February 27, 2004.

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