

Key Performance Indicators Drive Best Practices for General Contractors

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Running a profitable construction firm is a difficult business. Faced with an unprecedented number of external pressures such as eroding profit margins, higher owner expectations, rapidly changing technology, and a dwindling workforce, only contractors who follow best practices will achieve a higher return on investment (ROI) and reduce their risk.

The following eye-opening figures illustrate the difficulty of this industry:

- According to Dun & Bradstreet, more than 10,000 construction firms fail annually.
- The surety industry lost \$3.4 billion between 1998 and 2003.
- Most failures are attributable to poor operational execution, neither bad strategy nor the external market.
- Many general contractors are just one difficult project away from bankruptcy.

Given the difficulty of the construction market, FMI Corporation and Microsoft Business Solutions explored what best-of-class general contractors use as key performance indicators (KPIs) for business evaluation and decision-making. KPIs are meaningful yardsticks that contractors can see and use to effectively communicate the day-to-day operations of the business, supported by the best practices of general construction. FMI has found that the best-of-class contractors have fine-tuned their organizations by aligning people, processes, and technology to produce results that are better than the industry average. Best-of-class contractors are in the top 25 percent in profitability and ROI relative to their peers.

The construction industry has generally accepted KPIs that indicate the overall health of a firm. However, the definition and understanding of each of these KPIs varies widely since a typical general contracting firm has a complex combination of legacy software, disparate software systems, and a proliferation of spreadsheets that are used to operate the business.

Key Performance Indicators (KPIs)

The following are the KPIs identified by FMI and Microsoft Business Solutions as used by best-of-class contractors:

1. Liquidity indicator
2. Schedule variance indicator
3. Work-in-process (WIP) reporting
 - a. Margin variance indicator
 - b. Project cash flow indicator
 - c. Unapproved change-order indicator
 - d. Committed cost indicator
4. Backlog indicator
5. Scorecard indicator.

No one single KPI can provide a complete picture of business performance. Viewing all KPIs as a group provides a more accurate total picture. With this information, managers can understand the pulse of their business at a glance and determine if action is required. Therefore, KPIs prod management to drive organizational behaviors since they require specific business processes to make them meaningful performance measurements.

Complete integration of people, processes, and technology is an important first step in building best-of-class performance. The increasing sophistication and competition within the industry will force firms seeking improved performance and operational excellence to be early adopters of technological improvements. This early adoption will drive processes and produce the best results.

The following details each KPI, including its definition, uses, calculation, and significance to your firm.

Liquidity Indicator

Cash is the single most important asset that keeps a contracting business operational; all sins are forgivable but one, and the unforgivable sin is running out of cash. The complexity of contracting makes forecasting cash flow difficult at best. Late owner payments, schedule delays, invoice processing, change-order approval, vendor/subcontractor payments, labor costs, and numerous other factors affect the timing and ultimate receipt and disbursement of cash.

Understanding cash flow is of critical importance and is discussed in detail in the WIP section. One key aspect of cash flow is cash demand or liquidity which is discussed here. A manager should have the ability to evaluate organizational liquidity and then be able to drill down and see which projects are providing liquidity and which are using liquidity. Once liquidity at the project level is known, an organization can work to improve it.

The next step toward liquidity improvement is to identify actions that will improve the cash generation process. A project that is losing money may still be generating positive cash flow. Conversely, a project that is making money may produce negative cash flow. A positive cash flow can be achieved improperly by not paying subcontractors and vendors, for example. Therefore, causes of both negative and positive cash flow require investigation and analysis.

Looking at cash flow from a contractor's perspective reveals six key balance sheet accounts that are largely controlled by project managers. A contractor is funding his WIP with his own cash if the current asset accounts of accounts receivable, retainage receivable, and under billings (costs and earnings in excess of billings) exceed the current liability accounts of accounts payable, retainage payable, and over billings (billings in excess of cost and earnings

on contracts). The funding can be in the form of equity or borrowed money.

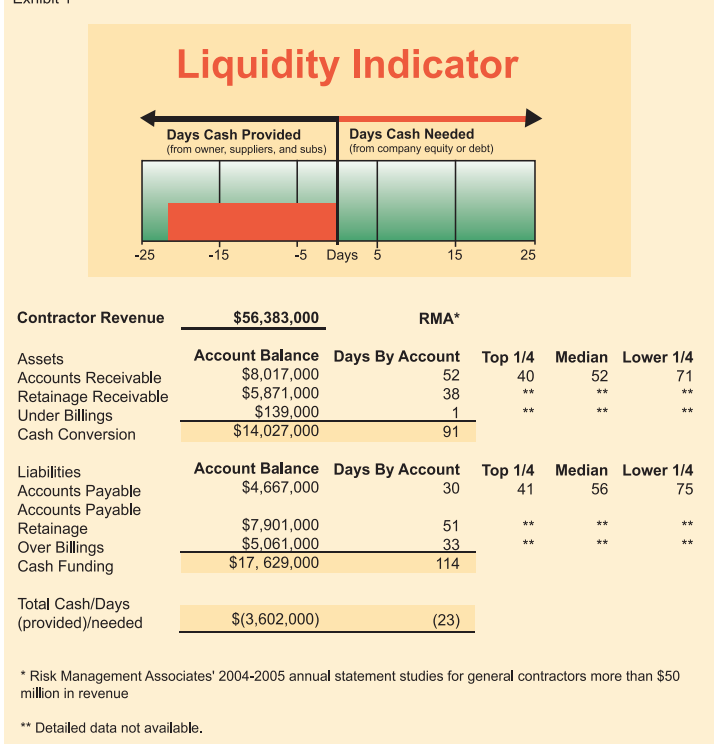
Conversely, the contractor is funding his WIP with the project owner's money if the current liability accounts *exceed* the current asset accounts. The difference in this equation will be one of three possibilities:

1. Zero, in which case the funding and asset accumulation are in balance.
2. A positive number, in which case cash is being applied to operations. That is, the general contractor is financing the WIP.
3. A negative number, in which case cash is being provided by operations. That is, the owner combined with subcontractors and/or vendors are financing the WIP.

The current asset and liability accounts can be converted to the equivalency of a number of days' revenue outstanding by dividing annualized revenue by the 365 days in a year producing an average daily revenue amount. The average daily revenue amount is also the amount of cash that can be generated from operations if improvements are made in the ratio, or relationship, of these key accounts of current assets to current liabilities.

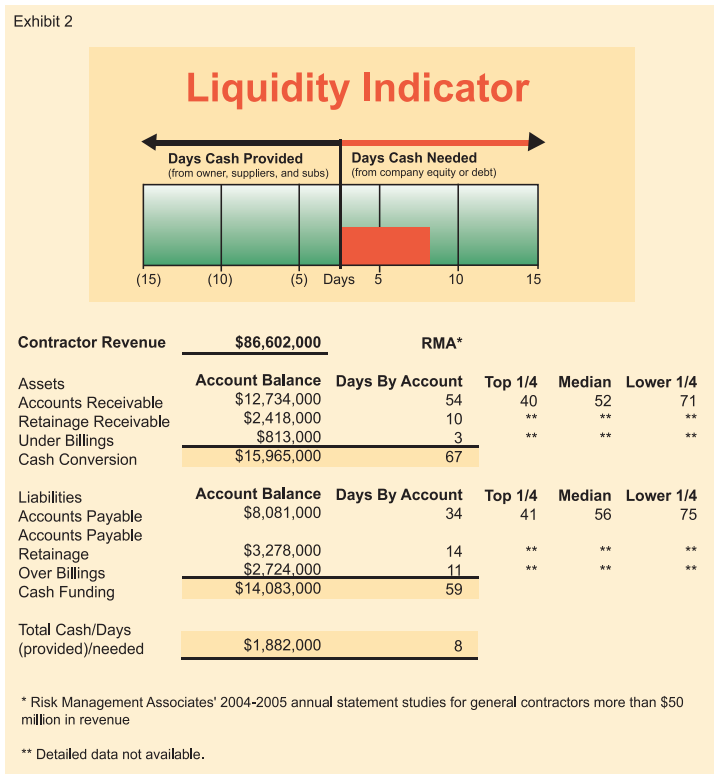
Dividing the current asset accounts and current liability accounts by the average daily revenue produces the days outstanding for each account. Those numbers can then be totaled to determine the net impact. The net impact is the average number of

Exhibit 1



days of liquidity applied to or provided by WIP by each account. The accounts receivable and accounts payable days outstanding can be compared to industry averages such as that compiled by the Construction Financial Management Association (CFMA) or Risk Management Associates (RMA) for general contractors to determine positive and negative comparisons to similar size general contractors. (See Exhibit 1.)

Exhibit 2 is a general contractor with annual revenue of \$86.6 million, which converts to an average daily revenue of \$237,300. If this contractor is able to accelerate over billings and improve collections of accounts receivable a net improvement of five average revenue days or equivalency, \$1,186,500 (5 days X \$237,300) in generated liquidity would result. Exhibit 2 also compares actual results to RMA data.



The range of days outstanding of accounts receivable and accounts payable for a general contractor within a certain volume range varies significantly within the industry. The goal for your firm should be to rank in the top 25 percent of firms in this comparison survey. These firms have best-of-class financial management practices.

Schedule Variance Indicator

Construction project owners are demanding faster construction, cutting the typical project duration dramatically. This schedule compression has made scheduling today of crucial importance. General

contractors with the ability to meet and deliver projects quickly have a major competitive advantage. The goal of scheduling is to create a tool that can be used to drive the project and build credibility with all the participants, particularly the owner. Quality, safety, communication, planning, coordination, and resource utilization are all enhanced through the scheduling process, which includes updates to it and integration of input from all project participants. Scheduling and its value in communication to owners sets expectations, seeking owner satisfaction with the project's execution.

Project schedules represent a detailed plan of individual activities, sequencing, duration, and interdependence. Many project schedules are prepared simply at the inception of the project. Though most owners require submission of these schedules as part of the contract, not all general contractors leverage the full advantage of schedules by using them continuously to drive projects to successful completion. The integration of subcontractors into project schedules is critical to effective scheduling.

Schedules that are loaded with costs, resources, and labor hours help identify cash flow and overall resource requirements. These schedules are invaluable in developing an aggressive schedule of values that are then submitted to owners for payments on progress billings.

Effective scheduling techniques include the integration of subcontractor schedules into a master schedule from which project execution is driven. This process establishes and communicates critical milestones, critical paths, and delivery dates.

Most change orders have schedule implications. Change orders can be directed by owners, generated from changes in the field, or necessitated by environmental changes in the construction process. General contractors who correctly maintain an updated schedule that reflects changing conditions increase their ability to manage the construction process and scheduled completion dates. Using the schedule to proactively manage change orders increases the general contractor's ability to identify and communicate favorable and unfavorable performance variances to all project parties. Schedules also document completion dates, which helps minimize the impact of damages.

Schedule performance can be evaluated by simply looking at the variance in terms of days. The variance is calculated by taking the original planned completion duration minus the current forecasted completion duration. The difference is the number of days the schedule is ahead or behind. But that provides only a partial perspective.

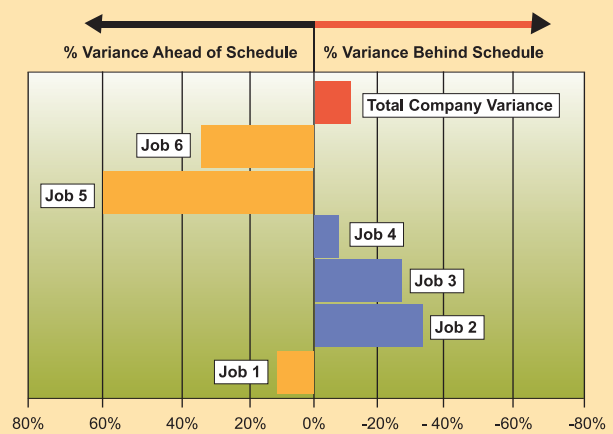
Contractors should also evaluate what the variance means as a function of the remaining duration on

the project. Taking the schedule variance in days and dividing it by the total remaining duration in days shows the variance as a percentage of remaining duration. This information enables the contractor to evaluate the significance of the schedule variance. A negative variance of five percent of the total remaining duration is clearly easier to make up than a 35 percent variance. (See Exhibit 3.)

A well-built schedule saves time and money for all the parties when used to develop a fully integrated, collaborative solution.

Exhibit 3

Schedule Variance Indicator



Work-in-Process (WIP) Reporting

Project execution is the heart of every construction business. Measuring and monitoring WIP ensures timely corrective actions and confirms project execution according to plans. Four of the most important project execution results are: gross margin, cash flow, change orders, and project buy-out execution (including procurement contracts). A KPI is presented for each of these critical project execution functions. Together, the status of these indicators gives the general contractor and owner a global project performance perspective. The stage is set for risks to be minimized and margin enhancement opportunities to be leveraged proactively. Positive project cash flow is maximized as well.

Margin Variance Indicator

The calculations for margin variance compare gross margins on in-progress projects, completed projects, WIP, and annual business forecasted. This big-picture approach gives the owner an understanding of how their total work program is performing relative to the annual plan. The general contractor can then analyze gross margin variances by project, comparing the actual performance to the estimate for the pe-

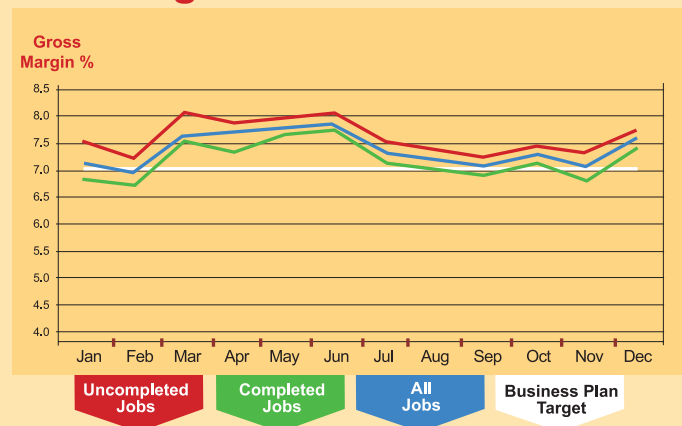
riod. Similar comparisons for the cumulative costs on the project can also be made. (See Exhibit 4.)

The margin variance is calculated by comparing various margins. The forecast margin percentage is obtained by taking the forecast gross margin and dividing it by the forecast revenue. The actual gross margin on closed jobs is divided by the actual revenue on closed jobs to get the completed contract gross margin percentage. Work-in-process gross margin is divided by revenue on WIP to calculate the WIP gross margin percentage. Finally, all contract gross profit for the period is divided by all the contract revenue for the period to find the total WIP gross profit percentage.

This KPI identifies the company gross margin performance, provides a comparison to business plan objectives, and promotes accurate estimates of cost-to-complete on projects.

Exhibit 4

Margin Variance Indicator



Project profitability is the core of general contractor profitability. Timely and accurate tracking of project profitability is also critical to success in the field. A good analogy is that of an airplane cockpit, loaded with dials and gauges that provide instantaneous feedback to the pilot. The pilot responds to the feedback with corrections or maintains the current course and headings. If your field superintendents had instantaneous feedback information systems, how much better could they perform? Identifying current and cumulative margin variances and making immediate corrections leads to control of project profitability.

Project managers must know their estimated costs-to-complete each project phase and throughout the entire project. While knowing this information is an important part of their job, there is an art to it.

A one percent overstatement on percentage of completion for a \$5 million project creates a profit overstatement of \$50,000. (See Exhibit 5.) When this error is subsequently identified, there will be a corresponding \$50,000 reduction in the next period's profit.

Exhibit 5

Percentage of Completion

Data at period end

Contract amount	\$5,000,000
Total estimated cost at completion	\$4,700,000
Percentage complete	42.55 percent
Reported revenue	\$2,128,000
Cost to date	\$2,000,000
Gross margin reported	\$128,000

Revised data at period end

Revised calculation:

Contract amount (unchanged)	\$5,000,000
Total estimated cost at completion (revised)	\$4,813,000
Revised percentage complete	41.55 percent
Revised reported revenue	\$2,078,000
Cost to date (unchanged)	\$2,000,000
Revised gross margin reported	\$78,000

Project Cash Flow Indicator

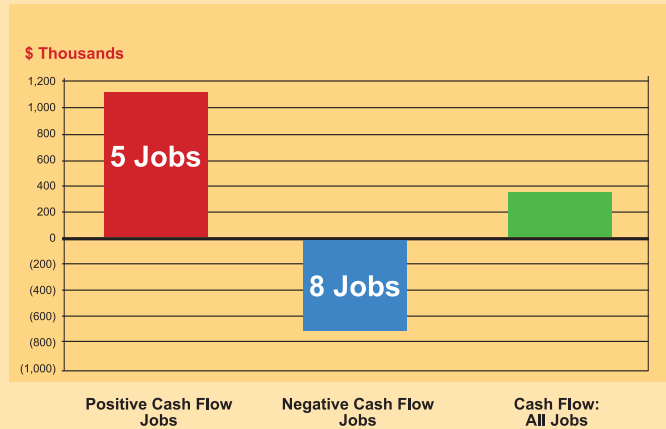
Project cash flow is another principal element of the project manager's responsibilities. This indicator answers the question: Are your projects providing cash or consuming it? A project's cash position is a key measure of WIP and project profitability.

Net project cash flow is computed by comparing all cash receipts on a project less all cash disbursements. Over billings and under billings affect this result in the long-term. The KPI is calculated by finding the net of all positive and negative project cash flows. The result gives the project manager a clear picture of how his or her work program is directing cash flow for the company. (See Exhibit 6.) It also identifies company cash flow from project execution, communicates potential project execution problems, and promotes project billing and collections on projects.

A common technique for contractors experiencing a cash crunch is to fund one project with another project's cash flow. This practice is a sign of serious trouble. The same is true for subcontractors; a subcontractor's positive cash flow is essential to their ability to complete work on time and with quality. Margins in the industry provide little room for collection or credit risk problems with subcontractors.

Exhibit 6

Cash Flow Indicator



Unapproved Change-Order Indicator

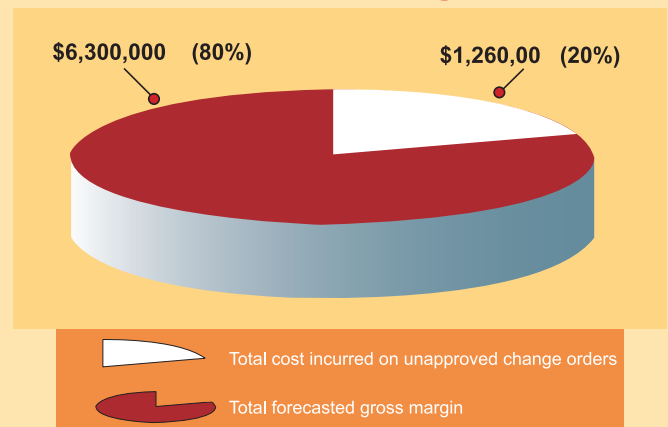
The goal of the change-order process is to inform the owner of changing conditions that impact cost and schedule. Costs incurred through unapproved change-orders identify possible financial exposure so contractors should be diligent in communicating these to owners and seeking early approval. Contractors successful at early notice and timely approvals of change orders ultimately reduce their financial risk and increase client satisfaction.

The accumulation of costs incurred on unapproved change-orders is separately identified as a KPI. The sum of these costs represents a significant financial exposure for general contractors. Comparing these costs to the total forecasted gross margin dollars for the work represents the percentage of gross margin at risk to the business owner. (See Exhibit 7.)

The best time to establish change-order procedures is at the inception of the contract. Following a standard change-order process increases the percentage of approvals. However, delays in processing, meeting

Exhibit 7

Unapproved Change Orders



notification requirements, and confronting changes causes significant challenges to the successful negotiation of changed conditions. Lack of detailed point-of-impact documentation on schedules and costs (contemporaneous records, in legal terms) weakens a general contractor's legal position. Owners prefer to do business with contractors who can be trusted to provide timely information and who show supporting analysis for all schedule and cost implications on their projects.

Change-order management is an integral part of project management. Approximately 15 percent of the final contract value in this industry comes from change orders. The process is known and understood by general contractors and subcontractors, yet many firms still struggle with the process. The unapproved change-order indicator serves to alert business managers when the process is headed out of control. Senior managers are not always intimately involved with the project's details, and they need an indicator to promptly capture this data.

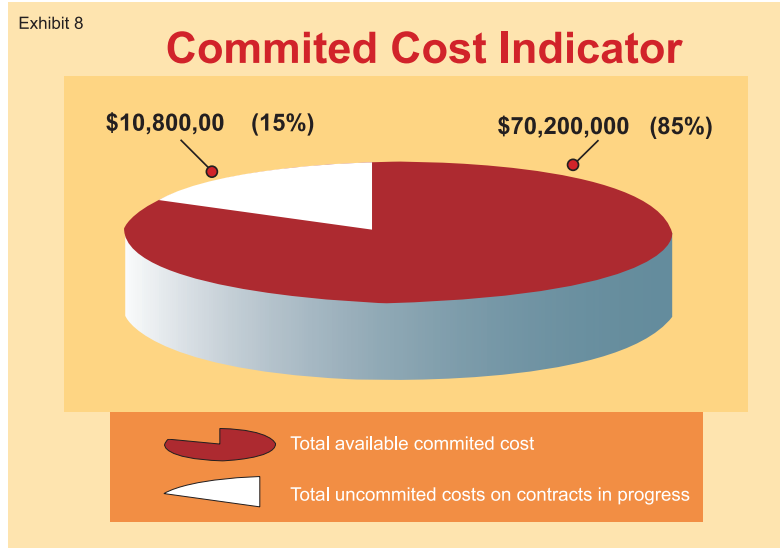
General contractors must also track costs on change orders separately from the base contract and approved change-orders. General contractors need to know the amount of margin generated by the base contract vs. that generated through change orders in order to answer the question: Did gross margin improve or fade on change-order work?

Committed Cost Indicator

The final WIP KPI for best-of-class contractors is the committed cost indicator. Effective job buy-out includes executing purchase orders for materials and executing contracts with subcontractors. The financial exposure, or contingent liability, comes from material price increases and subcontractor pricing prior to contractual commitment of suppliers. Both can escalate out of control if ignored. Contract length can be several years in duration and material price escalations, without supporting contract provisions for cost increases, leave the general contractor with significant financial exposure. Where price escalators are not feasible, contingent costs must be included to provide some protection to the contractor with a fixed-price contract.

Exhibit 8 shows the impact of open commitments when contract buy-out processes have not been fully executed, reflecting the contractor's potential exposure. Corrective actions can be initiated when owners are aware of these financial exposures and decisions are made on how to mitigate potential financial losses.

The calculation of uncommitted costs is the total of all uncommitted costs in WIP divided by the total available committed costs on all projects, subject to buy-out on all contracts. The KPI serves to identify company exposure to price increases and promote early execution of project buy-out procedures.



The KPIs of margin variance, project cash flow, unapproved change-orders, and committed costs provide a general contractor with a global perspective on WIP. The indicators set the stage for risks to be minimized and margin enhancement opportunities to be leveraged in a proactive and timely manner.

Bringing all elements of the WIP process together allows for timely payments of change-order work for changing conditions on contracts. Delays caused by material shortages and non-delivery of key components can be avoided and schedules can be maintained. Most importantly, project management personnel maintain their communication with owners and are assured that the client service is at optimal levels.

Backlog Indicator

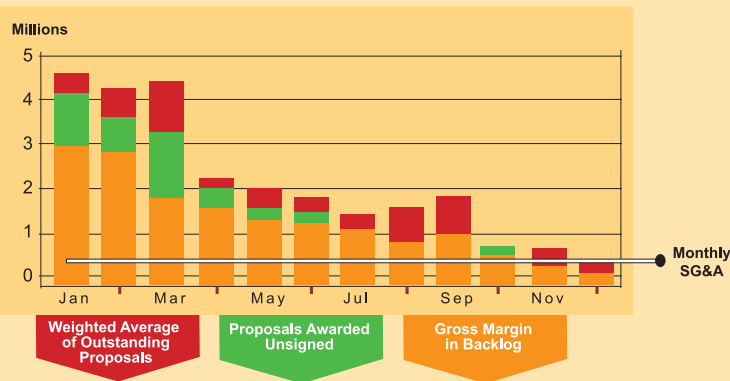
General contractors adept at backlog management position themselves well to select those business opportunities that will ultimately provide the most margin. The reverse is also true since construction-industry cycles dictate that if backlog decreases to a point where losses are expected, cost reductions have to occur to maintain profitability.

The KPI for backlog is calculated by adding the total of all gross margins forecasted for projects minus the total earned gross margins on all projects. Gross margin on awarded but unsigned contracts can be added to this total. The indicator identifies gross margins on future projects and serves as an early warning indicator of profit fade.

Variations of this calculation exist in the industry, and some include an expected value estimate of potential projects using the probabilities for securing these projects. The total of gross margins in backlog is then compared to selling, general, and administrative expenses budgeted for future periods. (See Exhibit 9.)

Exhibit 9

Backlog Indicator



Backlog tells a business manager a great deal about an organization's future performance. Backlog includes signed contracts in process, awarded proposals, and some percentage of outstanding proposals relative to the firm's historical hit rate. The backlog provides some assurance of future revenue and gross margin opportunities. The backlog makes a solid foundation for contractor decision-making.

Contractors with too little backlog will likely accept work at lower margins in hopes of just "covering overhead." Conversely, contractors with a strong backlog can frequently demand pricing premiums since they have the confidence of a strong business book. Contractors' hit rates may go down with the higher pricing, but the contractors' gross margins increase.

Backlog management, supported by effective marketing and business development practices, is critical to a contractor's success. By understanding what opportunities have been captured and what opportunities are on the horizon, a contractor can make informed decisions about what projects to pursue and how to price them. Most general contractors consider a backlog of six to 12 months, with adequate margins to cover overhead and profit, desirable.

It is equally important that general contractors understand their capacity. Growing too quickly without trained personnel to execute the work leads to major financial risk. FMI coined the expression "Volume kills, profit thrills," to underscore the hazards of rapid growth. Two major causes for business failure are failure to understand the business thoroughly and growing too quickly. A key function of management is to ensure that capacity, both financial and staffing, is not exceeded.

Effective backlog management also allows a contractor to evaluate their performance against the business plan. A firm should be able to evaluate their revenue and margin performance by business segment. General contractors who assess backlog while considering

capacity limitations can make strategic decisions about project acquisition, which results in proactive business management.

Scorecard Indicator

Because most organizations have a tendency to look only at objective, quantifiable indicators, it is easy to overlook the importance of qualitative measures that are less calculable. Best-of-class organizations realize the importance of evaluating their qualitative performance. As a result, many implement a process by which they evaluate softer skills. We have termed this the "Scorecard Indicator." (See Exhibit 10.)

Identifying the soft skills lacking in project personnel is challenging. Scorecard indicators provide a non-confrontational way to identify skill gaps. By evaluating the qualitative performance of the organization, problems can be identified earlier, preventing the escalation of the "paper war" with owners, subcontractors, and other project stakeholders.

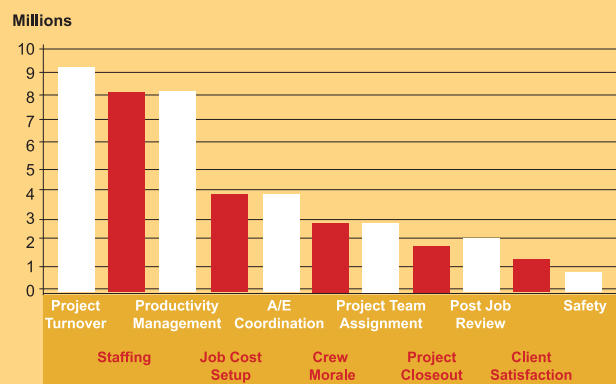
Organizations that use scorecard indicators generally have better safety records, higher productivity, improved quality, employee retention, and client satisfaction. The project-delivery scorecard also helps identify training and development needs.

The scorecard is a list of important "success factors" that are weighted according to importance and scored according to performance. Such a scorecard represents a qualitative assessment of the processes driving high productivity and margin enhancement on projects by various project team member roles. A high score indicates a higher probability of successful project execution.

The scorecard provides a methodology to evaluate key aspects of organizational performance. The same principles can be applied to numerous other aspects of a project that are less quantifiable. Examples include project documentation such as submittals, RFIs, and correspondence, along with subcontractor management, customer satisfaction, quality, safety,

Exhibit 10

Scorecard Indicator



and other productivity drivers such as short-interval planning, daily huddles, and performance evaluations.

Providing a methodology to evaluate qualitative performance is paramount. Purely financial metrics fail to consider such key success elements as process compliance, culture, and leadership. The scorecard indicator also provides an organizational self-assessment and is a key ingredient in continuous improvement.

Conclusion

We have discussed KPIs including cash demand, scheduling, WIP reporting, backlog management, and the project-delivery scorecard. Timeliness of these measures is critical since early awareness of problems provides greater opportunities for corrective actions. Equally as important is the ease of obtaining the data that flows into the timely development of these indicators. While the numbers are quantifiable, the best practices themselves are the key to execution and driving these numbers into superior performance.

All KPIs need to be viewed in the aggregate total to properly assess organizational performance. One KPI alone does not provide the total picture. KPIs are also not a substitute for a firm's financial statements or the traditional ratio analysis. The intent of KPIs is to provide meaningful indicators that contractors can see and use to effectively communicate the day-to-day operations of the business, supported by the best practices of general construction.

A typical firm's set of disparate systems makes capturing and disseminating critical information difficult at best. The implementation of a fully integrated system that captures and disseminates KPIs throughout all appropriate levels of the organization allows an organization to make more informed decisions.

Fully integrated systems establish processes by which information will be captured. Therefore, systems drive behavior within an organization. All too often, excuses are provided as justification for lack of accomplishment. With so much risk and so many variables, what construction firm cannot justify capturing and disseminating information to the right parties, at the right time, to ensure intelligent decision making?

Recognizing the value of and need for a fully integrated solution is only the first step. The commitment to implementation is the next. The system is not only a long-term solution, but also a long-term investment that is required to allow a firm to capture the associated benefits. The commitment will be significant in time, effort, and capital; however, the ROI will be substantial and ensure the success of your organization well into the future.

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FMI delivers innovative, customized solutions to contractors; construction materials producers; manufacturers and suppliers of building materials and construction equipment; facility owners, managers, and developers; engineers and architects; surety companies; and industry trade associations.

FMI's experienced professionals assist businesses with strategic planning, leader and organizational development, business development, research, mergers and acquisitions, peer groups, private equity placement, project execution, and training.

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Liquidity Indicator**Key Equations:**

Accounts Receivable + Retention Receivable + Underbillings = Cash Conversion

Accounts Payable + Retention Payable + Overbillings = Cash Funding

Cash Conversion – Cash Funding = Cash Demand

Subcontractor Revenue / 365 days = Average Daily Revenue

Schedule Variance Indicator**Key Equation:**

$$\frac{\text{Original Duration (days)} - \text{Revised Duration (days)}}{\text{Total Remaining Duration (days)}} = \text{Schedule Variance (\%)}$$
Margin Variance Indicator**Key Equations:**

Forecasted Revenue – Forecasted Direct Costs = Forecasted Gross Margin

Actual Revenue of Closed Jobs – Actual Direct Costs on Closed Jobs = Actual Gross Margin on Closed Jobs

WIP Revenue – WIP Direct Costs = WIP Gross Margin

Cash Flow Indicator**Key Equation:**

Sum of Projects Cash Receipts - Sum of Projects Cash Disbursements = Project Cash Position

Unapproved Change-Order Indicator**Key Equations:**

$$\frac{\text{Sum of Costs incurred on unapproved change orders (\$)}}{\text{Total forecasted gross margin (\$)}} = \% \text{ of margin at risk}$$
Committed Cost Indicator**Key Equation:**

$$\frac{\text{Sum of Uncommitted costs on contracts in progress}}{\text{Sum of All available committed costs}} = \% \text{ Uncommitted Costs}$$
Backlog Indicator**Key Equations:**

Sum of Forecasted gross margin – Sum of Earned gross margin = Gross margin in backlog