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Duquesne Light
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Project Management

Key Performance Indicator (KPI) Overview

By: Michael McCormick
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KPI Overview

A metric, by definition, is any type of measurement used to gauge some quantifiable component of performance. A metric can be *directly collected* through observation, such as number of days late, or number of defects found; or the metric can be *derived* from directly observable quantities, such as number of Change Orders, or a cost performance index (CPI). When used in a monitoring system to assess project or program health, a metric is called an indicator, or a key performance indicator (KPI).

Project metrics can be categorized into three main categories:

1. Pure project management measurements (Example: Estimation accuracy)
2. Indicators of project success (Example: Zero Injuries)
3. Indicators of business success (Example: Positive CPI).

At the ***macro*** level, metrics management means identifying and tracking *strategic* objectives. This is often done by the PMO, if one exists. When reporting metrics to management, it is important to keep the time factor in mind. True success or true failure may not be apparent until long after a project is formally closed.

Examples of macro-level metrics include:

- Number of successful projects
- Percentage of failed projects
- Number of hours spent per project
- Number of Change Orders per Project
- Number of Schedule Delays (Days)
- Number of Project Schedule Rebaselining
- Number of Projects Delayed by Pre-construction Process

At the ***micro*** level, metrics management means identifying and tracking *tactical* objectives. It is only by looking at the task level metrics that status of higher-level work packages can be ascertained, which can then be reported to project team members.

The following criteria are some common tactical measures people want to be updated about:

Tactical Measure	Question Answered	Sample Indicator
Time	How are we doing against the schedule?	Schedule Performance Index (SPI) = Earned Value (EV) ÷ Planned Value (PV). =>1 Ideal Index
Time	Planned to Actual?	Schedule Variance (SV): Schedule Variance is computed by calculating the difference between the earned value and the planned value: EV-PV. =>0 Ideal Indicator
Time & Cost	Weather Impact	Number of weather related delay days
Cost	How are we doing against the budget?	Cost Performance Index (CPI) = Earned Value ÷ Actual Cost
Resources	Are we within anticipated limits of staff-hours spent?	Amount of hours overspent per work schedule
Scope	Have the scope changes been more than expected?	Number of Change Requests or % of Contract Value exceeds allowance (>3% of CV)
Quality	Are the quality problems being fixed?	Number of commissioning defects and corrective action impact (Days/Man-hours)
Quality	Client Satisfaction Residential/Commercial	Number of Complaints or Damage Claims
Action Items	Are we keeping up with our action item list?	Number of action items behind schedule for resolution
Risk	Risk Management	Number of Risk that changed to Issues

I. Characteristics of KPI

KPI is a term specifically used to indicate criteria adopted in evaluating an employee's or contractors performance. Following are some characteristics of KPI:

1. A KPI must be aligned with the organization's objectives;
2. A KPI is determined by management;
3. A KPI must be designed so that it is easy to understand;
4. Some KPIs are specifically designed for each employee or contractor;
5. KPIs are expected performance by the organization;
6. KPIs must be designed to balance the evaluation of each employee or contractor;
7. KPIs lose their accuracy over time; therefore, it is necessary to revise KPIs periodically.

II. Requirements of a KPI:

An effective KPI should be:

1. Specific;
2. Measureable;
3. Achievable;
4. Performance relevant;
5. Containing deadline requirement.

III. How to design a KPI?

1. Design Key Result Areas (KRAs) and the importance of each KRA;
2. Identify necessary procedures to perform each KRA;
3. Identify the measurement criteria for each KRA and evaluate the importance of each criterion;
4. Summarize the criteria and the importance of each criterion;
5. Develop a summary table of KPIs.

IV. Key Result Areas

1. Definition of Key Result Areas (KRA)

"Key Result Areas" or KRAs refer to general areas of outputs or outcomes for which the department's role is responsible.

Key Result Area in simple Terms may be defined as Primary responsibilities of an Individual, the core area which each person is accountable.

2. Importance of KRAs.

- Set goals and objectives
- Prioritize their activities, and therefore improve their time/work management
- Make value-added decisions
- Clarify roles of department or individual
- Focus on results rather than activities
- Align their roles to the organization's business or strategic plan
- Communicate their role's purposes to others

3. Conditions of KRAs

- Key result areas (KRAs) capture about 80% of the department's work role. The remainders are usually devoted to areas of shared responsibility.
- Each KRA should capture at least 5 % of work role

V. List of KPI Mistakes

Building KPI system plays an important role in evaluating job performance of individual parts, divisions and the company's objectives and performance management system in general. The development of KPI metrics help to create measurement systems, information systems throughout the organization.

When building KPI system, you should note the following factors:

- Do not create too many, KPI be built around 3-5 KRAs (Key Result Areas).
- KPI should change to suit each stage (depending on your goals).
- Limit 3-7 KPIs per process/function.

VI. KPI Examples

Construction KPIs:

1. **% of waste recycled -** Percentage of construction and demolition waste recycled.

2. **% Construction cost in use -** Measures the annual operating and maintenance cost of a construction expressed as a percentage of the actual design and construction cost.

3. **Time to rectify defects -** Measures the contractor's time to rectify all defects in the maintenance period, from the moment the project is available for use until the end of the contractually agreed period for rectifying defects.

4. **Regulation compliance KPIs include:**
    a. Number of small violations per year.
    b. Number of medium violations per year.
    c. Number of big violations per year.
    d. Number of violations by sector.
    e. Costing lost by violation.
    f. Time lost by violation.
    g. Violation rate by department.

5. **Liquidity -** Determine how much cash your work in progress is generating or consuming by monitoring key current asset and liability balance sheet accounts.

6. **Cash flow -** Understand whether individual projects are generating or consuming cash so you can better identify execution problems on projects.

7. **Actual construction hours vs. Planned construction hours -** The actual project construction man-hours are recorded and analyzed against the original planned (baseline) construction man-hours on a monthly basis.

8. **Backlog -** Properly tracking backlog—and the expected gross margins on backlogged work—allows construction firms to avoid the problems associated with insufficient work and profit fade.

9. **Actual construction time -** This KPI is the actual construction time for the contract that formed the basis of the contractor's bid (excluding any extra works).

10. **Committed cost -** With rising material prices and labor shortages, construction firms face financial exposure when suppliers and subcontractors are not yet committed contractually—particularly on longer-duration projects.

11. **Remediation of defects after handing over -** The KPI weights the defects remedied in the first year following handing over based on man-hour consumption.

12. **Customer satisfaction/scorecard -** To maintain competitive advantage; track your firm's ability to meet owner expectations by compiling and analyzing qualitative feedback.

13. **% of defects entered in the handing-over protocol -** This KPI shows the number of defects recorded in the handing-over protocol during the handing-over meeting in respect of the contract to be evaluated.

14. **Work intensity (man hours per m2) -** This KPI is calculated for new builds and repair and maintenance projects, but not for infrastructure projects.

15. **Margin variance -** Compare your gross margins to business plan objectives by monitoring overall margin variance.

16. **Unapproved change orders -** Construction firms face an increasing economic threat from risk transfer provisions in standard contract types.

17. **Time Predictability Design -** Change between the actual design time at Commit to design Construct and the estimated design time at Commit to Invest expressed as a percentage of the estimated design time at Commit to Invest

18. **Time to rectify defects in maintenance period -** The Contractors time taken to rectify all defects in the maintenance period between Available for Use and End of the Contractually Agreed Period for Rectifying Defects (expressed in weeks).

19. **Labor productivity -** Labor productivity is particularly important for subcontractors because productivity problems can break labor budgets and erode profit margins.

20. **Schedule variance -** Project owners demand clear communication regarding project progress and timely completion.

21. **No. of activities starting on time -** The time schedule accuracy in estimating the start time of each activity.

22. **Cost per km -** Design, construction, maintenance and administration costs per km of various infrastructures

23. **% Cost predictability -** Measures the rate at which the actual construction costs meet the estimated construction costs.

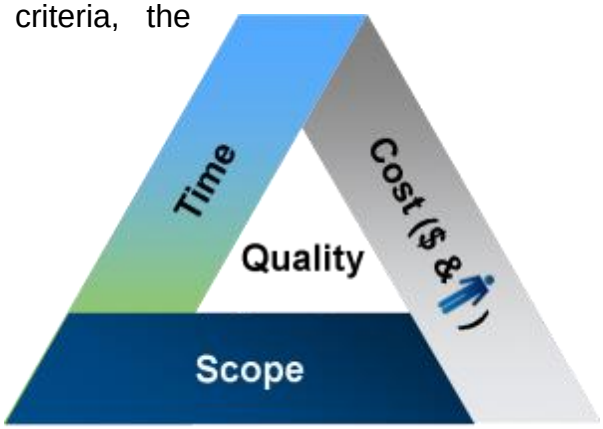
24. **Earned man-hours -** Measures the man-hours corresponding to the completed work in place.

25. **Working time -** % of total hours lost to absenteeism.
    a. Average overtime hours per person.
        i. Low number is indicator of proper scheduling and reduces opportunity of human fatigue related events.
    b. % of man days lost due to strike.
    c. Total time lost by work late.
    d. Lost time due to non-fatal accidents or accidents per year.
    e. Lost time due to weather delays.

KPIs for Project Management

When we want to create KPIs for PM, we need to use the CSC (Critical Success Criteria) related to project management. This means that the KPIs must be related to Time, Budget and Scope (TBQ) triple constraints.

In order to relate to these three critical criteria, the assumption is that tasks contribute to scope.



- Each task involves resource.
- Each resource is related to cost.
- Each task needs time for completion.
- Therefore Earned Value Analysis or Management is the tool that we usually used to measure these three key performance areas.

The following are some sample of KPIs related to Project Management (or Earned Value elements):

Earned Value (EV): This is the value that we get back as a result of the investment. For example, after the contract is signed, nothing is done but the vendor is paid 10% of the project fee; so, the earned value is still $0. Unless some work already performed and can be translated to the value.

Schedule Variance (SV): The difference between the original plan and the actual schedule progress.

Cost Variance (CV): The cost difference between the original project budget and the actual expenses.

Schedule Performance Index (SPI): To show how well the schedule is managed against the baseline. This means that, for every $1 we spend on the resource, how much progress is achieved.

Cost Performance Index (CPI): To show how well the cost is managed against the original budget baseline. This means that, for every $1 we spend on the resource, how much value we got in return. For example, if we pay $1, but we get $0.5 of the value of the result, that means the CPI is poor.

Other KPIs that may be applicable are such as:

Customer Satisfaction: For example, we can measure the return customer in quantity, or customer terminates the contract, etc.

Process Efficiency: For example, the speed in getting one job done is compared between the post-project to the pre-project measurement.

Quality Efficiency: For example, the number of defects, etc.

Performance Reporting: Effectively managing a project is a many layered process and effort.

Performance Reporting

Performance Reporting has a number of components that need to be effectively meted out by the project management team leader as well as by individual members of the project management team, or by groups of project management team members, at the assignment of the project management team leader. One of the most essential elements of the effective coordination of the project is the effective and complete dissemination of communication regarding the current performance elements to all of the interested parties. Performance reports are the mechanism that makes this possible. Performance reports represent the actual documents that offer a thorough organized view of work performance information to date, any earned value management parameters and calculations, and the to date analyses of project work progress and status. A number of common formats include those of multiple chart types, tables, histograms, and S-curves. *Note: This term is defined in the 3rd and the 4th edition of the PMBOK.*

Work Performance Information

Part of the executed project management plan includes the routine collection of work performance information. The information gathered is important, and is useful as input data for quality control measures and programs. It is also useful when audits, quality reviews, and process analyses are conducted. This is especially true of work performance information collected which includes technical performance measures, project deliverables status, required corrective actions, and performance reports. Pertinent work performance Information is essential to the project management plan and includes, but is not limited to:

- Status information on schedule progress.
- Whether deliverables have been completed, or not.
- Start and finish status of schedule activities.
- Quality standards expectation results.

- Authorized costs vs. costs incurred to date.
- Estimated completion time for scheduled activities in progress.
- Percentage of physical completion of in-progress schedule activities.
- Experience based knowledge acquired, documented, and posted to knowledge base.
- Details of resource utilization.

Gathering and analysis of work performance information is essential to the project management plan and should be considered a priority. Work performance information contributes to the efficient use of resources, identifies potential trouble spots and problems, and serves as an effective project management tool

Project Execution Outputs – Work Performance Information

In the process of managing project execution outputs, gathering data on the status of project activities is vital for enhancing communication with stakeholders. It also provides invaluable input for everything from scheduling to quality assurance. Collecting work performance information should, whenever possible, be carried out using protocols established during the planning phase. Automated reporting is an excellent option, but if your organization doesn't have the resources to implement data tracking tools, the process may have to be done manually. Skipping this aspect of project execution isn't an option. Without this information, it is impossible to accurately track the progress of a project or anticipate and overcome obstacles to completion.

Progress/status reports should include information such as:

- A list of deliverables that have been completed along with those still outstanding
- An overview of schedule activities that have commenced and those that are completed.
- Of the schedule activities currently ongoing, the percentage of work that has been done.
- Estimated time and/or resources required for in-progress schedule activities.

This set of project management data points provides a clear picture of work done, what's left, and areas where work is currently occurring. The information can also be distilled into a percentage of the total project that has been finished. A quick perusal of this type of report (along with access to the WBS Dictionary) can give stakeholders a realistic idea of whether or not the project, as a whole, is on track. Often, simply

providing an updated report on a regular basis is all it takes to reassure upper management about a project's progress. However, this type of report can also be used to highlight areas for improvement and to make a case for directing more resources toward a specific activity as needed. A smart PM will always review progress reports prior to distribution and have a handle on any questions or concerns that a report is likely to trigger.

Additional items to gather work performance information about include:

1. Whether and to what extent quality standards are being met.
2. Total costs authorized and the amount of money already spent.
3. Lessons learned documentation added to the project management knowledge base
4. How project resources are being used

Item **number 4** in the list above deserves a little more attention. The details regarding the use of project resources might also include an analysis of any underutilized resources. When it comes to monetary resources, available funds that ended up being unnecessary and remaining unspent may be viewed as positive. However, an under-utilization of human resources is often simply a waste. Whether it is labor hours or talent/skills that are being squandered, this is an issue that should be addressed immediately. Similarly, if a component or material ends up not being required it may reflect a loss. Attempts should be made to recapture the value of unused materials through resale, recycling, or use in other areas of the project.

The Project Baseline

The noun baseline in general usage refers typically to the conditions that exist at a given point, usually the start point, of an activity, study, or project. An example of this usage can be found in medical studies, in which participants vital signs and other measurements at the start of a study are referred to as their "baseline measurements" represents the approved time phase plan for a particular item, factoring in the addition or subtraction of approved project cost, scope, schedule, and technical changes. This approved time phase plan can apply to a number of components of a project, including the project as a whole, a work package, a schedule activity, or a work breakdown structure component. The term baseline, although in most common usage applies to the current baseline, can be used to refer to the original baseline (or some other specific baseline altogether). The term baseline is typically used with a modifier of some sorts. Some examples of this are "cost baseline", "performance measurement baseline" and "technical baseline".

Baseline Start Date

The term baseline start date applies to the actual scheduled start date of a schedule activity within the approved schedule baseline. The baseline start date will typically be estimated at the onset of a schedule activity based on a determination of how much work needs to be done, how many team members will be required to complete it, which specific team members should be involved in the process (and concurrently what their schedules may look like in regards to availability), and what resources may be needed. The baseline start date may be adjusted prior to n activity's kickoff if it has become apparent that delays in preceding activities will make the previously determined baseline start date impossible to meet. Provided the project team is able to secure the necessary approvals to do so, the baseline start date can be modified based on the requirements necessary. See also scheduled start date.

Baseline Finish Date

The term baseline finish date applies to the date on which a schedule activity is expected to be completed within the approved schedule baseline. The baseline finish date will typically be estimated at the onset of a schedule activity based on a determination of how much work needs to be done, how many team members will be required to complete it, which specific team members should be involved in the process (and concurrently what their schedules may look like in regards to availability), and what resources may be needed. The baseline finish date may be adjusted at any point during the activity if needed, for instance, in situations where delays occur that make it apparent to the project team that the baseline finish date that has been set will not be met. Provided the project team is able to secure the necessary approvals to do so, the baseline finish date can be modified based on the requirements necessary.

Technical Performance Measurement or Indicators (TPM/TPI)

TPM is the process by which project management can measure the risks inherent in a given project. Technical Performance Measurements provide insight as to the parameters of the specific design elements of the system. Technical Performance Measurement is used by project management to define the measures of performance and acceptable variables during project implementation.

Use of TPM benchmarks should be limited to factors which negatively affect the primary measures of performance, which are schedule and budget. Project management should not use TPM to measure typical project goals, but strictly as a preventative measure to ensure that the project is delivered on time, and for the targeted budgetary goals. Studying these technical performance measurements provides the opportunity for management to develop tolerable risk ranges to evaluate the parameters of the project.

TPM values are implemented at the beginning of a project, as to ensure that projected performance values, within tolerable variance ranges, are met. Throughout the project, the actual performance is tracked and compared by project management to the TPM that was deemed acceptable at the project's outset. These constant comparisons mean that corrective or preventative action can be taken early in the project, preventing failure or delays later in the project timeline.

TPM Example

In this example, the Project Manager's (PM) Performance KPI's can include Performance Measurement of the project's contractor(s). This KPI can vary by project scope, complexity and duration. For example, on a 12 month project the KPI=3 Inspections at 3 month intervals by the PM. The measurement criteria example is defined below.

Measurement Methodology, Inspection & Acceptance Example

Step 1 - Overview

1.1 Performance monitoring is a key component of this contract. Both the PM and the Contractor must actively monitor performance to ensure that the construction is successfully completed and the Performance Goals are met.

1.2 The Contractor is free to use any reasonable method it believes appropriate to monitor performance, discover issues, and take remedial action as appropriate to meet the Performance Goals.

1.3 The PM's intent is not to dictate how the Contractor chooses to monitor its own performance, but rather to know that the Contractor is meeting the Performance Goals set forth in the project's contract SOW. Contractors must also have their own performance monitoring program, which must be described in the Contractor's Quality Management Plan and proposal.

1.4 The DLC Project Management representatives will conduct periodic (i.e., daily, quarterly, monthly, annually, etc.) performance monitoring and evaluations. The combination of the selected monitoring levels shall help ensure progress and acceptable performance throughout the term of the contract.

1.5 The PM and the Contractor will conduct performance monitoring. The DLC inspectors may inspect the quality of the work performed to ensure that it meets applicable specifications. The PM's role is to verify that the desired outcome (construction is completed and Performance Goals are met) is produced.

Step 2 - Daily Monitoring

2.1 The Contractor shall maintain a daily log for the Project. The log must contain information regarding:

A. Activities of the Contractor's crews, including the locations where work is performed;

B. Complaints received from the general public for which Contractor response is required;

C. Unusual or unexpected conditions uncovered in the course of work activities;

D. Incidents involving safety either of the general public or Contractor work forces;

E. Quality testing results.

2.2 The PM shall track the daily activities against the work schedule. The Contractor will advise the PM of any variations from the work schedule.

2.3 The Contractor shall monitor the daily activities of the field crews, and obtain the following data:

A. Types of work being performed and location;

B. Issues and situations encountered or reported by the public and actions taken to mitigate them;

C. Coordination among Contractor staff, DLC personnel, utility operations, and others whose work impacts the items under this RFP.

2.4 The Contractor's daily reports must be available to the PM to assist in verifying daily progress under the contract. A good working relationship between the PM and the Contractor's day-to-day Project manager is essential for Project success.

2.5 The DLC or its representative will conduct reviews. If it is determined during any review that work does not meet the quality standards outlined in the Standard Specifications, or the required contract Performance Goals, the DLC or the Contractor will address the issue at no additional cost to the DLC.

Step 3 - Cyclical Evaluations

3.1 Note: This section will specify the frequency of the evaluation. There are a number of frequency options for measuring performance, including:

A. Continuous Measurement
B. Cyclic (Hourly, Daily, Quarterly, Weekly, Monthly, Annually)
C. End of project or at project milestones
D. Long-term

The frequency will depend largely on the specific performance goal, and must be defined for each goal. Also, as dictated by specific Performance Goals, the Contractor should collect hourly or daily data on an hourly or daily basis, but it may be more reasonable to present the data once a week to the PM.

For example: Daily manpower and equipment units are tracked. If the scheduled called for 4-boom trucks, 8 hrs per day for 5 days for a total of 160 boom hrs per week and the contractor reports 152 hrs, then the schedule productivity is negatively impacted by 8 hrs or 25% of the daily production criteria. In this scenario, over a 30 day schedule with 8 hrs loss production per week would equal 32 hrs (4 days) or 5% project production loss and if the schedule end date KPI = 1 day (1.25%) then this KPI would not be met.

Mitigation Plan: The PM would require the Contractor to adjust the work schedule to offset for the weekly loss production by increasing daily work production at the Contractors expense. One possible solution is to increase 2 Booms schedule from 8 hrs to 9 hrs (1 hr of overtime x 2 booms) 4 days of the weekly schedule.

If the Contractor is unable to meet the required mitigation plan, then the PM would report the Schedule KPI performance issue with management and request a “rebaseline” of the schedule to offset the schedule slippage by 4 days.

3.2 At specified intervals throughout the project, the PM and or designee(s) and the Contractor (or its representative) shall perform an evaluation of the work zone and/or the Contractor's records of actions completed in that period to review Contractor progress and performance.

The PM also reserves the right to perform unscheduled or "surprise" inspections. These evaluations shall be objective evaluations of the Contractor's performance against the Performance Goals. The evaluators will review the work completed or in progress and shall assign the appropriate Level of Performance score.

The evaluator personnel shall be kept as consistent as possible to ensure comparability of the reviews as required by the project duration. Randomly selected samples may be generated for items included in each category each period; this will help the PM and Contractor avoid with reviewing only problematic or successful areas. An approximate 10% sampling rate may be used to select the review items or as required in the project design specifications. This will vary by type of project.

The frequency of data collection may be impacted by the innovations introduced on the Project. For example, if a long-lasting material is proposed and implemented, this may

necessitate only intermittent site visits to collect resulting data. There may be other economic, temporal, spatial, or other indicators that allow for reduced data collection/analysis efforts.

The PM or his designee(s) shall generate reports that summarize the review's findings and shall note deficiencies throughout the Evaluation, and shall include these deficiencies in required reporting cycles.

3.3 To help identify trends, DLC or its designee(s) shall summarize and compare the review results against the results for previous periods. DLC shall also compare the results against either the baseline condition or the previous Comprehensive Evaluation.

3.4 The PM shall discuss the results of the Evaluations with the Contractor. The PM shall also report a general level of performance satisfaction along with recommendations and concerns. The Contractor also may bring issues to the attention of the PM, along with suggestions for future activities. Periodically, the PM may visit sites where Project personnel have reported deficiencies and for which the Contractor must perform remedial work.