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INSIGHTS

Are Metrics Helping You Win Your Game?

Tips for Developing Manufacturing Key Performance Indicators (KPIs)

In baseball, statistics are kept on anything that can be measured. Some are used for decision-making during the game, others are used for comparisons between teams and players, and a few are just plain entertaining like how many times the same-named pitcher has pitched to the same-named batter. Important stats have immediate impact. Like when a batter is up against a pitcher where the odds are too high for a hit, real-time details help determine whether the pitcher should be replaced. Instant information. Game-altering decisions.

Access to timely, accurate information can help you improve your performance, no matter what field you are playing on. Wikipedia lists about 90 commonly-used baseball statistics. If only manufacturing performance metrics were so prescribed.

Think about it. Do you have the right information to monitor your manufacturing operations? Are your metrics helping you ensure product quality and drive continuous improvement? Do your Key Performance Indicators (KPIs) really matter to your operation? Using lessons learned and other important tips, we can help you develop the KPIs that make the most sense for your business. Like baseball managers, you too, deserve the best information to make your game-time decisions.

"You have to be the one setting your own goals, trying to achieve those goals."

Johnny Bench

Official Rules: Definition of Terms

To ensure we're all on the same playing field, here's a review of key terminology:

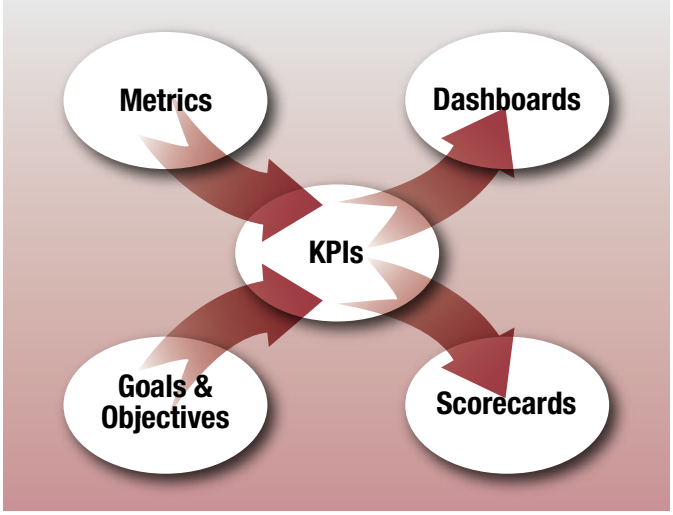

Diagram 1: Data Flow

What are metrics?

- In simple terms, a metric is a measure.[1]
- In more explicit terms, a metric is a numerical measure representing a piece of relevant business data in relationship to one or more dimensions. An example would be customer rejects per product per month. In this case, the measure is customer rejects and the dimensions are product and month.
- Not all metrics are KPIs.

What is a KPI (Key Performance Indicator)?

- Simply stated, a KPI is a metric that is tied to a target.[2]
- KPIs are critical financial and operational metrics used to monitor how well a business is achieving its quantifiable objectives.
- A KPI is a statistical measure used on its own, or in combination with other key performance indicators, that shows how well an organization is doing in a particular area. A KPI could measure a company's financial performance or how it is holding up against customer requirements.[3]
- KPIs are developed from goals linked to an organization's strategy.
- KPIs can also be known as Key Success Indicators (KSI).
- All KPIs are metrics.

What are dashboards?

- Generically, a dashboard is a dynamic set of indicators regarding the state of a process, piece of equipment, or business at any specific point in time.[4]
- Descriptively, a dashboard is a graphical display of KPIs shown as a ratio of actual to target and designed to instantly let a business user know the current status. For example, a metric of widget sales per month becomes a KPI when a target of $100,000 is applied. If today's actual sale per month is $75,000, then a percentage gauge presentation of 75% would be displayed on a dashboard. The user would instantly see that they were at 75% of their goal.
- A dashboard falls one level down from a scorecard in the business decision-making process. It tends to be more operationally-focused.
- Dashboards can also be referred to as digital dashboards, executive dashboards, dynamic dashboards, and enterprise dashboards.

What are scorecards?

- Simply stated, a scorecard is a report of select KPIs compared to their targets.
- A scorecard is a part of a broader corporate methodology or management discipline. It is a report card of how a given person, business unit, or entity performed with respect to certain goals over a previously defined period of time (such as quarterly or annually).
- A scorecard is a level up from a dashboard. It tends to be used to ensure that operational execution is aligned with the business strategy.
- A balanced scorecard is a strategic management tool that includes measures for internal processes and external outcomes.

Spring Training: Lessons Learned

The lessons learned are grouped into four areas and while they certainly don't cover everything, they do pinpoint some key considerations when developing or reviewing your metrics, KPIs and/or performance management program.

Lesson No. 1 - Be aware of what you measure. This can be stated in several ways. Try these: "that which gets measured gets done" and "metrics drive behavior." This is a very interesting phenomenon because whatever you have metrics for becomes what is important to the organization. The metric becomes the focus. So be careful what you measure because you will get more of it. On the other hand, "the law of unintended consequences" indicates that those items that you do not measure are not likely to improve. For example, say that your "problem" (challenge) is to generate new sales. If the measurement is *quarterly sales increase*, the result is that managers become short-term focused and may forgo more "risky" long-term thinking.

Similarly, simple metrics such as *equipment utilization* can eventually result in overproduction and high inventory levels, or a *labor efficiency* metric could result in increased handoffs and motion. Being aware of what you measure is wise advice. Here are some preferred examples: a metric of *equipment up time* results in equipment available upon demand and a metric of *count of physical and informational handoffs* results in limited motion.

Dr. W. Edwards Deming, regarded by many as the leading quality guru in the U.S., offered the following comparison:

a) When people and organizations focus primarily on quality, defined by the following ratio:

$$Quality = \frac{Results\ of\ work\ efforts}{Total\ Costs}$$

quality tends to increase and costs fall over time.

b) However, when people and organizations focus primarily on costs (often dominant/typical human behavior), these costs tend to rise and quality declines over time. This is due largely to not minimizing waste, ignoring the amount of rework, taking staff for granted, not rapidly resolving disputes, and failing to notice a lack of product improvement—and over time, a loss of customer loyalty.

By measuring specific areas and sharing these metrics, your employees will be motivated to improve.

Lesson No. 2 - Keep your measures simple. Basic advice, but so true. As opposed to baseball, manufacturers cannot, and should not, measure everything. Most organizations measure too many things and with too much granularity. If you are starting out, focus on 4-5 metrics or KPIs per division, site, or department. Your metrics should be clear so they can be quickly and easily interpreted and acted upon. Ensure that they focus on what matters most and use the common language of your business. Keep explanations on file which describe each metric, its development, and the objective or strategy that it's meant to support.

Use the S.M.A.R.T. test to ensure you are on track:

S	**Specific**	**Defined, understandable, precise, unambiguous, simple**
M	**Measurable**	**Significant, quantitative**
A	**Actionable**	**Drives the correct action to be taken to improve performance**
R	**Reviewed**	**Utilized, dynamic**
T	**Time-framed**	**Timely, with a defined time period**

Keep metrics simple and flexibility will follow.

Lesson No. 3 - Ensure that your measures reflect the overall process. KPIs that focus on end-to-end, horizontal, and/or customer-centric processes actually improve an organization's performance more than departmental metrics. So, keep your KPIs at a high enough level so they reflect the overall process in your operation and they will have an end-to-end impact.

"If you can't describe what you are doing as a process, you don't know what you're doing."

W. Edwards Deming

Just like Lesson No.1, this lesson can be restated: "measurement systems should, first and foremost, reflect customer requirements". Studies have shown that organizations generally operate most effectively when KPIs are customer-centric. Examples of these include *actual product cost*, *order fulfillment*, *cost of quality* (i.e. material scrap and rework), and *on time delivery*.

The best way to do this is to align your KPIs with your business strategy and link the measures to relevant business objectives. This could mean starting with your corporate KPIs and translating them into division, business unit, and finally department metrics. Or start with your company vision statement or quality policy and cascade through your strategy, goals and objectives, and finally into the development of supporting measures (see Diagram 2). Or link your plant operations metrics with your financial metrics. For example, operational metrics of *lead times*, *cycle times* and *inventory* all link to the financial metrics of *cash flow*.

Consider Colin Snow's perspective. As vice president of supply chain performance management for Ventana Research, he reinforces this concept. "If you're measuring the number of units coming off the line, that might tell you your capacity rate or your fill rate," Snow observes. "But that number is meaningless if it doesn't align with corporate goals for reducing costs, increasing sales or improving customer satisfaction."[5]

The benefit of Lesson No. 3 is that when the measure reflects the overall process it ensures that everyone is aligned. Moreover, it ensures your employees are working for the organization as a whole, as opposed to working for their own self interests in traditional vertical silos.

Diagram 2: Priority Lineup

Lesson No. 4 – Provide your measures visually in real time. The idea we all dreamed of 20 years ago, is now a reality. Companies are using manufacturing execution systems (MES) and plant dashboards to provide instantaneous performance information to decision makers. Data is rapidly collected, aggregated and displayed, providing insight and visibility into areas like real-time inventory and shipment information.

"You can't measure what you can't see and you can't improve what you can't measure."

W. Edwards Deming

Restating this lesson in direct terms: "get out of the manual spreadsheet business!" Manually recording data, manually calculating results and then re-keying the data into a spreadsheet negatively impacts productivity. In addition to being very time-consuming, there are often time lags as well as accuracy, data verification and version control issues.

To ensure that your measures are displayed in real time, start by asking:

- Who is responsible for analyzing and monitoring the results of the metrics?
- What data is needed for which business owners and on what schedule?
- What mechanism do you have to gather the data for the metrics?
- When do changes need to be made to the metrics or application?
- Where is the data archived?
- How is the application and data maintained?
- How does your organization use these results in a timely manner?

Besides the obvious benefit of real time decision-making, Lesson No. 4 makes data available for other purposes such as real-time investigation support, auditing, trending, and trouble-shooting.

Create win-win scenarios for everyone involved by remembering these four key lessons:

Lesson No. 1— Be aware of what you measure because metrics really do drive behavior.

Lesson No. 2— Keep your measures simple and ensure they pass the S.M.A.R.T. test.

Lesson No. 3— Ensure your KPIs reflect your organization's overall process and specifically align to strategic company goals.

Lesson No. 4— Display your metrics visually in real time.

Now the Windup: Constructing Meaningful KPIs

KPIs must be developed and maintained as part of a formalized performance management program. This will not only help with ownership, routine checks, and any necessary changes; but ensure that your KPIs consistently give you the insight you need to continually improve your operations. We recommend that you begin with the following steps:

1 Assemble a multifunctional team. Establish ownership by including representatives from all of your key functional areas: operations, quality, engineering, maintenance, information technology (IT), finance, and accounting. Define each member's role and appoint a lead. Remember that IT's role may have an additional responsibility to present and display the metrics/KPIs on a centralized application.

2 Develop your KPIs. Your team should develop KPIs that align with and support your goals and objectives. Invest time to accurately define and analyze each KPI, mapping it to each of the four lessons. Do your KPIs drive the desired behavior and results? Are they simple and do they pass the S.M.A.R.T. test? Do they reflect the overall process? Are they presented visually so the appropriate decision makers can access them quickly and easily?

3 Develop and document your performance management program. Your team should formalize your performance management program. This includes identifying owners, deciding on the display format, identifying the display application, building dashboards and/or scorecards, and developing applicable procedures to manage and maintain the program.

4 Implement your performance management program. Once your team and management are both satisfied with the established KPIs and the program, introduce it to your organization with proper communication and education. The earlier your KPI owners understand their respective roles, the more successful the program will be.

5 Review your KPIs and your program periodically. KPIs should promote action and drive results. The review period should ensure this. Highlight any required changes and/or improvement opportunities.

6 Revise your KPIs and your program as needed. For optimal performance, continually change your measures to reflect your new standard of performance. Make updates to your KPIs and program after your established review period or as needed.

Typical KPIs

Manufacturing operations metrics depend on strategy, industry segment, process type, and market conditions. Below are typical ones:

Operational Metrics and/or KPIs	Quality – Compliance Metrics and/or KPIs	Business Metrics and/or KPIs
Safety compliance-OSHA reportable incidents/year	Process yields	Net operating profit
On time delivery to customer request	Operations yields	EBITDA (earnings before interest, taxes, depreciation and amortization)
On time delivery to commit	Open NCMRs (non-conforming material reports)	Labor cost per unit
Throughput or manufacturing cycle time	Days open CAPA (Corrective Action/Preventative Action)	Customer fill rate/on time delivery
OEE (overall equipment effectiveness)	First pass yield	ROA/RONA (return on assets or net assets)
Capacity utilization (actual vs. designed total)	Batch/lot/unit right first time	Market share
Material variance	Customer reject rate	Economic value/economic profit
Labor variance		Cash to cash cycle time
Average hours of overtime/week		Energy consumption per unit of production
Average days total inventory		

View of the Diamond: Designing Your Dashboard

To design your dashboard, start with a top-down approach. Look at the business decisions you need to make and then work your way down to the data needed to support those decisions. Involve the actual manager or business owner because they know specifically what business answers they need and what actions and decisions they would make with a given answer. Business owners should define the answers in a way that allows his/her users to get to the data behind their question. Beyond a drill-down option for more granular data, the dashboard should also be customized appropriately. For instance, a manufacturing supervisor may go from a chart of number of batches produced or throughput, to number of batches rejected or first pass yield to a breakdown of categorized production rejects per product per month to analyze the reasons for batch rejection and thus support his key decisions.

Different dashboard views should be designed for each employee based on his/her role in the organization. Create a strategy map that illustrates each manager's area(s) of responsibility and include at-a-glance KPI capability so they can view those that are specifically-related to their area. For instance, a system of color codes –typically green, yellow, and red—can alert managers to areas of improvement before they become problems.[6]

Metrics that Matter

According to MESA International's study, "Metrics that Matter: Uncovering KPIs that Justify Operational Improvements." manufacturers who improved the most against financial performance metrics have a metrics framework that links operations to finance, leverages plant software, and speeds data collection and feedback to the operation. The study also revealed that the top two manufacturing applications survey respondents planned to invest in were plant dashboards and manufacturing execution systems (MES). They found that those companies that use these applications cite more significant improvements against both their operations and business metrics than their counterparts who do not.[7]

Final Insights

Vince Lombardi once said, "If winning isn't everything, why do they keep score?" If you use metrics and KPIs to monitor and improve your manufacturing operations, you are keeping score and you are concerned about winning.

While your decisions may not need to be as instantaneous as a quick pitcher change, the consequences wield a far more significant impact. Imagine if you are trying to capture data from different spreadsheets within different departments. It takes time to pull it all together – only to find inconsistencies, errors, and redundancies. Consider a far more important fact – what if what you've measured doesn't even support your own corporate goals? That leaves you in a bad slump. And yet with the right metrics in place, an automated system that facilitates predictive analyses, and the processes in place for continuous improvement, it's a whole other ballgame.

But what's important to remember is that metrics alone will not improve performance. Taking action against them will. The first step is to have the right KPIs in place. The next is to use them wisely.

References

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About the author

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