Human Performance Improvement Task Group

Task 18-3 Metrics

Guidance for Measured Indicators of Human Performance

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Guidance for Measured Indicators of Human Performance

1. **Introduction**

Performance indicators, or metrics, are parameters measured to reflect the critical success factors of an organization. These measures provide facility personnel a way of knowing whether planned activities are occurring as originally intended as well as warning of developing problems. Many indicators are focused on the outputs for which an organizational was created; for example:

- to produce (neutrons, scientific papers, calculations, analyses, reliability levels, weapons, etc.),
- to protect against (such as security issues, physical harm, and environmental insult), or
- to maintain (e.g., compliance, safety, training qualification).

Metrics are developed by managers and process owners. These overall performance measures provide management and customers (present and potential) with outward signs of the organization's capabilities. Metrics help managers evaluate performance against goals, targets, and benchmarks. The metrics process creates an environment for aligned and fact-based improvement of performance and provides the basis for performance accountability. The metrics process uses leading and lagging indicators, all set within a framework of critical success factors (i.e., what an organization must do to be successful). Managers identify and correct negative trends before they adversely affect mission deliverables. Additionally, metric development may include benchmarking of key functional areas with other DOE contractors, industry, and research institutions, in order to achieve best-in class performance.

Behind those overall measures lie the human and organizational contributing factors that led to those outcome levels. These human and organizational metrics may not always be displayed in publications or on websites, but all levels of management can look to these internal indicators for <u>awareness</u> of dynamic performance trends (improving, static, or declining) and as <u>input for positive reinforcement or for corrective measures</u> to address the indicated issue(s). This document provides guidance in selecting and using human and organizational performance indicators to aid organizations that desire to maintain measured awareness of the human performance outcomes which support their ultimate success factors.

> **NOTE**: Much of the material for this guide is found in the DOE Human Performance Handbook, Volume 2, *Human Performance Tools for Individuals, Work Teams, and Management* (DOE-HDBK-1028-2009) with additional references noted throughout.

<u>Selecting appropriate and useful performance goals is a challenging process, which requires careful thought, recurring refinement, collaborations, and understanding.</u> Frequently, things are counted and reported as indicators because they can be measured; but they provide little insight as to how the organization is functioning and no clue to future performance. Metrics that monitor results/outcomes, either good or bad, are generally lagging indicators—they may be worthwhile measures but they do not prove that current or past performance will continue but do give insight into the current state of those topics. Monitoring processes or behaviors considered important to success provides leading indicators, which forecast things to come and future performance expectations.

Guidance for Measured Indicators of Human Performance

Per John Wreathall (Ref. 2), metrics, to be effective, should have the following characteristics:

1. **Objective**: They are based on observable and non-manipulatable sources.
2. **Quantitative**: They are measurable and can identify when changes in performance occur.
3. **Available**: They can be obtained from existing data.
4. **Simple to understand, possess face validity, and represent worthy goals**: It has been found ...that once indicators have been established, they become pursued as goals themselves. If the indicators themselves represent something worthy (*meaningful*), this pursuit (*of the right behavior*) helps the organization's performance.
5. **Related to and compatible with other [existing] programs**: In any modern enterprise, data abound in excess. It is generally undesirable to add an additional data generation program to existing activities.

These independently developed characteristics are reflected below in Section 3 criteria for judging appropriateness and utility of selected indicators.

"Data provided by indicators in itself does not provide improvements in [for instance] safety. It is the quality of the safety <u>management system</u> that is important (*emphasis added*). It requires a motivation and an understanding for the organization to be seeking opportunities for improvements. Such organizational attitudes as those described as 'high reliability organizations' or 'resilient organizations' are required for such tools to be useful." (Ref. 2)

2. Types of Indicators

There are essentially two types of indicators:

- **Lagging** – Measures of **results or outcomes,** which represent where you are and what you have accomplished, but do not necessarily predict future accomplishments; and
- **Leading** – Measures of **system conditions,** which provide a forecast of future performance; measures of **organizational "health,"** which can predict results and achievements.

<u>Examples of lagging indicators</u> include the following:

- facility/site event rate
- events involving active errors
- events involving latent errors
- event free clocks (time between events)
- industrial safety lost-time injuries per 200,000 man-hours worked
- collective radiation exposure
- frequency of contamination events
- rework (defined broadly as any action that results in loss of time, labor, money, or other resources within a particular period)
- ratio of repeat activities (within 18 months after maintenance) to work orders completed
- recurring corrective actions,
- recurring causal factors.

Examples of **leading indicators** include the following:

- time to implement corrective actions
- overtime and absenteeism
- self-reporting ratio (number of problems identified by workers vs. total number of problems identified)
- backlogs (e.g., procedure revisions, temporary modifications, leak repairs, workarounds, work orders, maintenance items)
- attitudinal/culture /climate surveys
- number of in-field observations (by managers and by employees)
- suggestions/deficiencies submitted per person per month
- number of employee concerns submitted

For additional lagging and leading indicators, please see Appendix 4 of Ref. 8, "Risk-Based Thinking: Managing the Uncertainty of Human Error in Operations, by T. Muschara, Routledge, 2018.

3. Determining HPI Indicators

A fundamental aspect of process management is having metrics that help you track how your process is performing. The same is true of HPI performance indicators. When developing a group of metrics, there are a few simple questions that can guide initial efforts to formulate an approach to measuring system or process performance. The very first thing to consider is what **behaviors** are critical to your organization's success/mission. This should be caried down from management to the department and frontline worker level. For management, it might be engagements with their group; for the group it might be feedback during those engagements and errors in the field. In each, dig further to ensure the driving behaviors are well understood. Next, narrow these down to the top two or three. For each metric, ask yourself:

1. What is already being measured, or, what is desirable to measure?
2. How will the organization measure it?
3. Why do I think that the way I am going to measure it will tell me what I want to know?
4. If I observe an adverse trend in performance, what actions will I (*recommend that we*) take?

Question 1 is the starting point. Identifying what you really want to measure – not just what you *can* measure – is vital. If you understand your 'systems,' then you should know how you expect it to behave and people in relation to it. Consider what aspects of human performance you want to ensure are occurring and track/trend so that you can see if there is improvement over time. The expression of each behavior or aspect of performance as an ideal or standard is your key to developing a good metric.

Question 2 is the hard part. Not only do you need to determine the way you are going to measure a specific aspect of performance, but you need to look at whether that is even feasible. If feasibility is only a matter of time, then an interim means may need to be used until the best means can be put in place. You will need data for your metric. Whether or not you have that data right now is something you need to determine. So, ponder the following additional questions:

For the Aspect of Human Performance Intended to Be Measured:

1. What means do I need to employ in order to measure or evaluate this aspect of my process?
2. What obstacles to meaningful measurement are there?
3. What specific data is needed to make that measurement or evaluation?
4. Is that data available now? (i.e., Is it currently being generated, captured, and stored?)
    a. If No: Is that specific data obtainable? (i.e., could I start capturing it and storing it?)
    b. If Not Yet: What do I need to do to obtain that data?
5. If the data I really need will not be available or is not obtainable, then ask: Is there some other data that, if I use it might not tell me exactly what I want to know, but will at least give me some kind of indication (i.e., an indirect measurement)?
6. Is that data reliable? (i.e., is it consistently generated, captured, and stored?)
7. How should I use the data I select to generate periodic measurements that I can track and evaluate over time?

Remember that <u>how you gather data</u> on behaviors is important not only to getting reliable datapoints but to maintaining trust and relationships in the organization. Early efforts at human performance metrics both within DOE and the nuclear power industry (Ref. 3) testify to the possible negative impacts of poorly designed and misaligned data gathering for HPI. "In many cases, these programs focus on documenting gaps in the application of human performance techniques at the expense of (unintentionally) influencing worker behaviors. In addition, these programs often have burdensome administrative requirements associated with documenting observations that actually challenge the ability of supervisors to get in the field and coach worker behaviors." This leads to expanding on the next question.

<u>Question 3</u> is a check back to Question 1. If in the process of finding and selecting a source of data in order to make measurements, this question will help you make sure that the means you have chosen in Question 2 to make measurements for your metric will actually give you a true indication of that aspect of your process. Not how often are we using HPI tools/techniques but are they being used when they should be and used effectively. If you find that what you started out measuring is not what you really want to measure, make it clear in your initial metric reports what is actually being measured and what you believe it is telling you related to what you really want to know. Meanwhile, continue to pursue ways to generate, capture and use the data that you *really* need.

<u>Question 4</u> is not a rush to action but an urging to seek understanding. If an adverse trend seems to be indicated in performance (indicated by data or just a perception of recent events), the initial actions should be to ask more questions and study the data, possibly using more targeted gathering techniques, to ensure the pattern is well understood before postulating solutions. There is nothing so useless and wasteful as a solution that does not address the real issue.

> *"Objectives and key results are a potent, proven force for operating excellence"*
> *John Doerr in "Measure what Matters"*

3.1. Metrics Related to Human Performance

For metrics dealing with the human elements of performance, which indicate if HPI principles are being implemented and embraced throughout the organization, it will be rare that development of a direct measurement will be possible – either because the data is just not obtainable or because what you want to measure is not directly measurable.

Therefore, in most cases an indirect measurement will need to be employed, from which some inference can be made about the thing you actually want to measure. Just as a speedometer in a car actually measures the rotational speed of the driveshaft in the transmission, the output of the transmission can be correlated to the speed of the car (assuming that all wheels have full traction, the original tire size is used, etc.).

For example, a simple HPI metric is the number of employees who have attended HPI Training. In fact, all this metric really tells you for certain is who has attended training – not whether the training is being retained long-term and is changing behavior, or more importantly, whether it is making a difference in your organization. Therefore, you would want to measure other things related to

HPI Principles

1. People are fallible, and even the best make mistakes.
2. Error-likely situations are predictable, manageable, and preventable.
3. Individual behavior is influenced by organizational processes and values.
4. People achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers, and subordinates.
5. Events can be avoided by understanding the reasons mistakes occur and applying the lessons learned from past events.

Ref. DOE-HDBK-1028-2009, Vol. 1

how principles and tools taught in the training are being used on a regular basis by supervisors and workers, such as in work planning meetings and pre-job briefings. Those measures will, indirectly, give you an indication as to whether the training was integrated into how work is done. As to effectiveness, assuming that training is just one of several initiatives you have launched to prompt organizational learning and change, other broader indirect measures will collectively give you an indication not only of how effective the training is, but also how effective all of your efforts are.

It is important to not sacrifice HPI principles in order to obtain data for your metrics. You do not want to create goals and metrics that discourage the reporting of errors or that jeopardize organizational learning. Even though sometimes what you want to measure (and improve) can be measured directly, it may be best to focus on and measure the changes you are making. Take for instance a goal to reduce workplace injuries, with a metric that tracks the number of injuries by department each month. While the goal was to keep workers from getting injured, such a metric may simply drive people to not report injuries. So, just because the metric shows a reduction in (reported) injuries over time, it doesn't mean that the number of injuries occurring has actually decreased.

It will likely take time and patience to get to the point where you can truly get a sense of how well HPI principles and tools are being used to improve overall performance. Just as the organization must mature over time, metrics and their associated data-collection efforts often take several iterations to mature to a point where they are true indicators of performance.

3.2. Steps When Selecting Performance Indicators

Google effectively used the philosophy of establishing and monitoring objectives and key results (OKRs) to transform human and organizational performance and thereby, the entire company (Ref. 4). Objectives are simply what is to be achieved, i.e., the significant outcomes an organization was created for and desires to grow into. Key Results are measurable goals that reflect how the objectives are achieved; they are specific, measurable, attainable, relevant/reliable, and time-bound, i.e., SMART.

3.3. Clarify the intended results statements.

Good performance indicators start with good results/outcome statements that people in the organization can understand and agree on.

- Carefully consider the result desired – precise wording and intention.
- Avoid overly broad results statements – use aspects believed to make the greatest difference to improved performance.
- Be clear about what type of change is implied. What is expected to change – a situation, a condition, level of knowledge, an attitude, or a behavior?
- Study the activities and strategies directed at achieving change.

3.4. Develop a potential list of indicators.

Use internal brainstorming and experience of other operating entities with similar indicators, as well as consultations with relevant experts

- What are the top priorities for the upcoming period (month, year, etc.)?
- Be inclusive of those providing input.
- Allow free flow of ideas and creativity.
- Consider the message or unintended consequence of the measurement.
- Three to five top objectives avoid dilution of focus. Feature what you need to achieve.
- Corollary: avoid too many indicators.
- For each objective, have three to five key results (measurable, clear, time-bound) or SMART goals that show progress.

Examples of HPI-Related Indicators for a hypothetical organization

Just as an organization is made up of several sub-organizations and groups, those specific groups each contribute to the overall organizational goals as well as to each other's output. It is the people working together within established systems and processes that achieve goals. The following table contains examples of possible indicators of human performance-related activities that are quite probably tied to the business outcomes of many organizations at DOE facilities. Many of these

examples are lagging, but some are leading. Be sure to include some of both. Some of the examples are output related (what people accomplish) and some are behavior related (how accomplishments are achieved). Again, a mix is recommended.

Table 1. Examples of Potential HPI Indicators for Organizational Entities		

Managers and supervisors
· Field Observations
· Meeting Effectiveness
· Engagement with all groups
· Rewards and recognitions
	Business & Administrative
	· Document Control
	  · PPA Skills
	  · Procedure feedback and revision frequency
	· Procurement:
	  · Supplier inspections
	  · Process issues
	  · Dedication backlog
		Engineering
		· Open Mods
		· Completed Mods
		· Error Precursors
		· Modification delays & reason
		· Benchmarking

Safety · USQD Qualifications · Ontime support of procedures and plant modifications · Error Precursors · System walkdowns with system engineers per qtr.	**ES&H** · PPE availability · Workplace Evaluations · Near-misses · Causal analyses · Cause codes · Timely approvals & causes for delays · Error Precursors	**Quality** · # Inspections Completed · Acceptance of deviant parts · Non-conformances · Number of NCRs accepted as-is · Time to close actions
Operations · Procedure Use Issues · Procedure feedback · Workarounds · Communication issues · Reported equipment issues · Pre-job brief integration of HPI elements · Error Precursors	**Maintenance** · Open Corrective Backlog · Past due PMs · Rework/repair/reject · Days between · Maintenance Events · Pre-job brief integration of HPI elements · Error Precursors · Tool availability	**Organizational Engagement** · Participation in assessments · Submitted concerns and issues · BBS or PBQ observations · Surveys & participation · Error Precursors Rollup

Training
· HPI Quals
· Benchmarking
· Participation in Community of Practice
	Performance Assurance
	· Days between HPI events
	· Timely reporting of relevant metrics
	· Benchmarking
	· Learning from events
	  · Post Job After-action Reviews
	  · HPI in Event Investigations
		HPI Manager / Lead
		· Observations
		· Engagements with Mgt
		· Engagements with Staff (comm & direct)
		· Benchmarking
		· Learning Teams Led
		· DLAs Led
		· Procedures reviewed for HPI
		· Benchmarking for best practices per year.
		· Participation in Community of Practice
		· Staff retirements/hires

3.5. Assess each possible indicator using the following criteria for judging appropriateness and utility.

1) **Direct** – Meaning the indicator should measure as closely as possible the result it is intended to measure.
2) **Objective** – An objective indicator has no ambiguity about what is being measured, that is., there is general agreement over interpretation of the results.
3) **Adequate** – Taken as a group, a performance indicator and its companion indicators should adequately measure the result in question.
4) **Quantitative, where possible** – Quantitative indicators are numerical. The numerical precision of quantitative indicators lends them to more agreement on interpretation of results data. Qualitative indicators can supplement the numbers and percentages with a richness of information.
5) **Disaggregate, where appropriate** – Disaggregating people-level program results by gender, age, work group, or some other dimension is often important from a management or reporting point of view.
6) **Practical** – An indicator is practical if data can be obtained in a timely way and at a reasonable cost. Managers require data that can be collected frequently enough to inform them of progress and influence decisions.
7) **Reliable** – Is the data from the indicator of sufficiently reliable quality for confident decision-making to be obtained?

When assessing and comparing possible indicators, it is helpful to use a matrix with these seven criteria arrayed across the top and the candidate indicators listed down the left side.

With a simple scoring scale, for example 1-5, rate each candidate indicator against these seven criteria. The ratings will help give an overall sense of the indicator's relative merit and help in the selection process. Be flexible and recognize that all seven criteria may not be equally important.

3.6. Select the "best" performance indicators for HPI.

- They should be an optimum set of indicators that meet the need for management understanding and decisionmaking — providing useful information at a reasonable cost.
- Leading indicators are more valuable than lagging indicators but are normally more difficult to select and use. A mix of both tied to meaningful performance characteristics, representing internal indicators (within parts of the organization) and external indicators (reported to oversight or regulators).
- Remember to consider the costs associated with data collection and analysis. Provide adequate staffing and computing/software resources in keeping with the expectations.
- Limit the number of indicators used to track each objective or result to a few (2-3). Select only those that represent the most basic and important dimensions of your objectives.

There is a good chance that sites already gather data which can provide valuable insights into the status and health of human performance in the organization. Consider first evaluating these against mission and goals, looking for gaps and instances where humans directly impact attaining performance goals. Also, evaluate existing data against the five principles of human performance and what existing data streams provide insights into how these are reflected by the organizations culture and actions.

3.7. Section Summary

Aubrey Daniels summarizes this process well in "Bringing Out the Best in People" in the section on turning good intentions into high performance. To achieve total quality, or for our purpose's high-quality human performance behaviors,

- Pinpoint the behaviors that will support the desired results.
- Develop measures for those behaviors.
- Provide performance feedback.
- Identify specific consequences that will be seen as positive reinforcement by the performers.

Items one and two were addressed in the first two sections. The third and fourth are to follow.

4. Trend Analysis and Response

FIRST PRINCIPLE FOR UNDERSTANDING DATA [Ref 6]
NO DATA HAVE MEANING APART FROM THEIR CONTEXT

Trend Analysis and Response (Section 4 below) is another challenging but crucial aspect of using performance indicators. The point here is to highlight that beyond selecting the "right" metrics, they must be properly selected and analyzed to achieve their real value. Simple graphing of raw data can be sufficient when there are reasonable quantities of data and trending is obvious. However, where there is limited data (e.g., lost-time accidents per month, dropped loads, or process shutdowns) a single event could appear to be a trend. Rolling averages do not improve the analysis of this type of data. Statistical data analysis over time is required to meaningfully use this data—ensuring appropriate reaction vice knee-jerk response. Per John Wreathall in Ref. 8, "all leading indicators typically drift up and down over time, and an organization can burn out trying to respond to all unfavorable trends. The goal should be to identify when there has been a significant change in indicators – when the underlying process has changed." This will avoid wasted effort in applying a technical change that (1) seeks to address a non-issue, (2) wastes time and resources, and (3) likely damages credibility and trust.

For many years, one of the most useful tools to understand variation in processes is the statistical process control (SPC) chart. From *Understanding Variation, Second Edition: The Key to Managing Chaos* (Ref. 6), Wheeler notes that, when people are pressured to meet an expected target goal/value, they can respond in three ways: improe the system, distort the system, or distort the data. Before any system can be improved, it must be 'listened to' to hear what the current process is telling you to gain understanding where adjustments are needed. This goes beyond whether or not current expectations/specifications are being met. To realize improvements will require organizational commitment to improvement and sustained effort over time.

Most organizations collect data on a number of the performenace-related areas given in Section 3. Statistical Process Control (SPC) define the "Voice of the system." They can communicate data clearly and simply to management as well as front-line workers. The underlying data analysis (outcomes over time) allows development of the upper and lower limits that define acceptable system variation, providing visual indicaton of trends that may indicate attention and/or action is required.   Developing

the natural process control limits takes time; thus, the importance of commitment to the data collection and analysis process.

SPC charts (Figure 1) are useful visualization tools for understanding system outcomes, helping to discriminate between noise and real issues. Properly designed and used, they provide a basis for sound decision making to improve human performance through system adjustments.
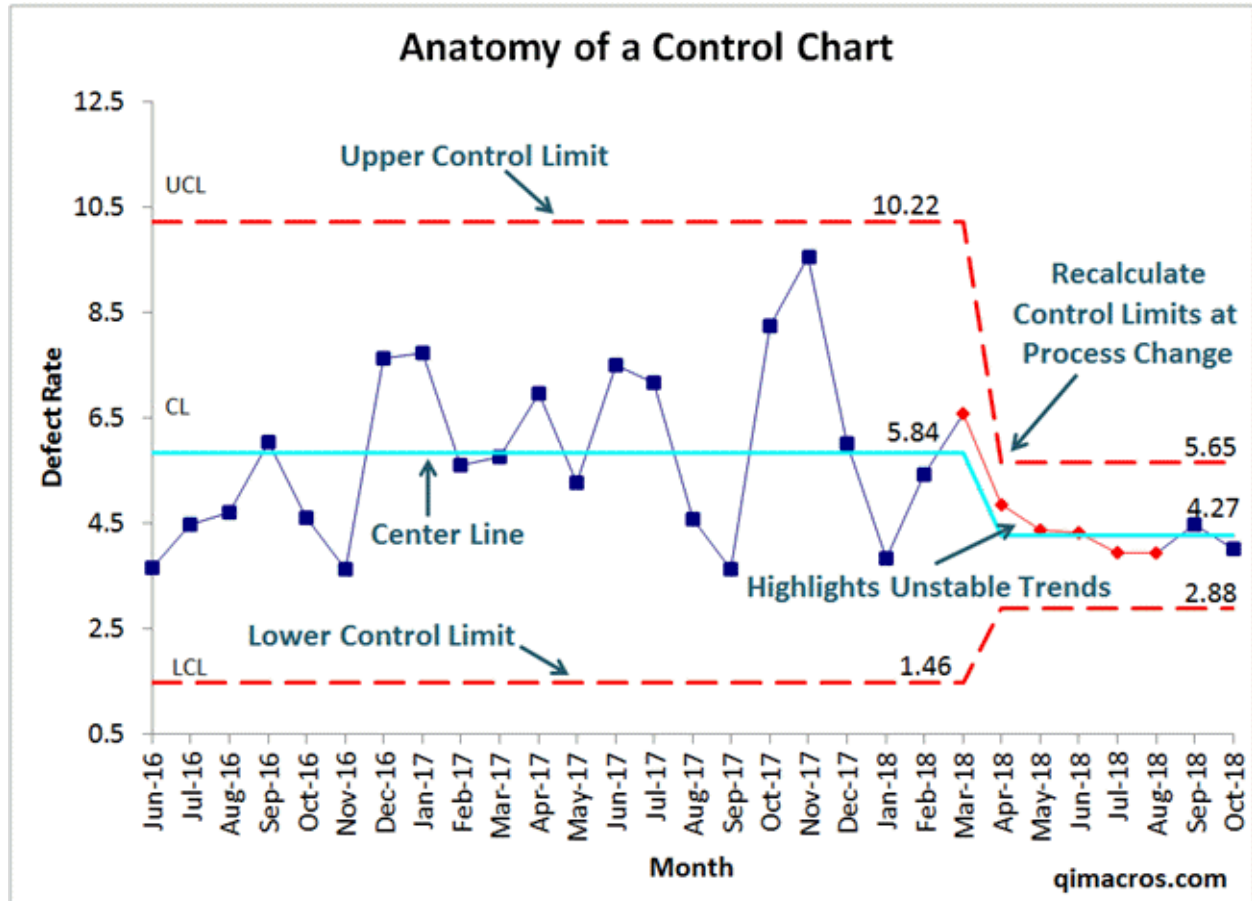

Figure 1 - SPC Example (qimacros.com)

There are many subject matter experts, books, and courses available which address statistical data analysis far beyond the scope of this document. Predictive analytics is an additional arena currently being applied in association with behavior-based safety. The point here is to highlight that beyond selecting the "right" metrics, they must be right for the organization and properly analyzed and acted on to achieve their real value. Consider the workforce and how they like to receive data. Tailor the dashboard to the intended audience.

Among the many additional resources recommended by contributors to this guide include:

- *Practical Performance Measurement: Using the PuMP Blueprint for Fast, Easy and Engaging KPIs*, by Stacey Barr, lays out a 'step-by-step blueprint to overcome the common struggles we all have with KPIs.'
- Consider Stephen Few's book "*Show Me the Numbers: Designing Tables and Graphs to Enlighten*" as well as Visual Business Intelligence Workshops from perceptualedge.com.

As noted above, complexity of the analysis and reporting technique can be as simple as plotting a bar chart or complex statistical analysis with control charts. The method and complexity should be appropriate for the organization, its values, mission, and the associated risk in achieving each.

SECOND PRINCIPLE FOR UNDERSTANDING DATA [Ref 6]
WHILE EVERY DATA SET CONTAINS NOISE, SOME DATA SETS MAY CONTAIN SIGNALS. THEREFORE, BEFORE YOU CAN DETECTE A SIGNALWITHIN ANY GIVEN DATA SET, YOU MUST FIST FILTER OUT THE NOISE.

5.0 Recommendations for HPI Leads and Managers

- Obtain general management agreement on the selection of performance indicators before collecting data. This will help ensure only relevant data is collected and that effort is not expended gathering information that will not be used due to a lack of connection to mission or priorities.
- Commit to a long-term, appropriate level of data collection and analysis to inform human performance behaviors and outcomes. Start with a small set to gain confidence, then change and expand as understanding and confidence grow. Allocate sufficient resources and balance the extra burden on HPI staff to prevent overload.
- Recognize that variation is inherent to all systems, and the use and application of HPI tools and techniques is no different.
- Avoid using a parameter simply because it is easy to measure; know what it is telling you about the aspect of human performance you are interested in.
- Avoid knee-jerk reactions, as noted above, to random spikes (up or down) in data; instead, seek to know the underlying reasons that caused the momentary shifts. In other words, do not use changes in performance indicators as justification for sudden austere measures. Learn in order to sustain positive practices and weed out system weaknesses. existing system.

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- A philosophy of issuing decrees based on perceived deficiencies does nothing to chante or improve the underlying system; rather, rely on sound data that reflects the natural variation of the Again from Wheeler (Ref. 6), "*if one is not pleased with the amount of variation shown by the natural process limits, then one must go to work on the system, to change the underlying process, rather than setting arbirary goals, jawboning the workers, or looking for alternatie ways of computing the limits.*"

5.1 Use metrics as director of focus for improvements and motivation.

A robust and effective data informed culture should drive a metrics program that provides all layers of management with data to make informed business decisions and take action based on observed performance trends. Human Performance metrics and indicators should be utilized by management to understand culture alongside performance. Additionally, leading indicators can be developed based on Human Performance data that points to performance trends and areas of weakness such as latent organizational weaknesses.

A missed signal is an opportunity wasted. Ref. 6

In order to utilize metrics to focus improvement actions and motivation, metrics must be developed with those goals in mind. A good reference for metric development (mentioned above) is the [Performance Measurement Process (PuMP®) developed by Stacey Barr (http://www.stacybarr.com)](http://www.stacybarr.com). This methodology helps drive the development of valuable performance measures and considers common struggles that organizations go through with development and use of metrics for informed decision making by management.

An initial key to developing metrics that can be used for focused improvement actions and motivation is to begin with the strategy and to translate goals into "clear, focused, and measurable performance results" (Stacey Barr). Additionally, in the development of those metrics, ownership from all stakeholders should be obtained, which will make those stakeholders more likely to value the information that the performance measures provides and therefore take appropriate action based on the metrics and related analysis.

In the metric development process, it is important to know what action a developed metric would drive. If stakeholders and metric owners cannot say what an adverse trend would drive in terms of management action, it is possible that the development of the metric and its value needs to be revisited.

Another key aspect to maximize proper management by metrics is addressing the way that performance indicators are measured and looked at for identified trends. A robust data-informed culture should be one in which management does not react rashly to monthly changes in data points that represent normal variation. Instead, alternate means of measurement, such as Process Behavior Charts or Control Charts should be utilized to determine when an adverse (or positive) trend has actually occurred that warrants addressing with action. By utilizing measurement tool such as these, better informed decisions will occur instead of non-value-added actions that react to normal variation in performance.

As processes evolve and become more data informed, it is essential that performance metrics do the same so that they may be optimally indicative of performance and utilized to drive action and motivation based on observed trends and analysis. In order to ensure that this happens and drive towards a more robust data informed culture, a proper performance measurement development tool should be used. In general, brainstorming, benchmarking, developing arbitrary dashboards, etc. does not adequately derive measurements that will be used for decision making, driving action, and improving performance.

The final element to implementing measures for focused improvements, actions, and motivation is to ensure that appropriate disposition pathways for performance trends and focused analysis are determined and utilized. It is possible for organizations to have optimally telling performance metrics that do not lead to action simply based on the lack of ownership and accountability taken by management. This ownership and accountability, in addition to clear disposition and escalation pathways, is essential to direct action based on identified trends. If this is considered in the metric development process and early ownership by stakeholders/management is achieved, management action based on the metrics is more likely in the long term.

5.2 Choose the Appropriate Platform for Communicating Metrics

After the correct measurements and metrics have been developed, metric owners must utilize the appropriately established platforms so that action can be taken, and the value of the measurements and analysis be fully realized. Examples include:

- Using of interactive dashboards

  - Create simple visualizations that can be interpreted easily, keeping the intended audience in mind.
  - Work with management to determine what they want to see in their dashboard.
  - Use data visualization tools to ensure that dashboards are easy to read and clearly support decision-making.
  - Different dashboards may be needed/desired for different layers of management, keeping in mind that management may later use these to communicate decisions or improvement actions to the organization.

- Publish and disseminate periodic aggregate reports at department performance review meetings and internal online resources

  - Utilize Process Behavior Charts or Control Charts to show statistically significant trends.
  - Consider the need for training management on the use and reading of these charts, as applicable.

For each selected metric, explain clearly the specific benefits provided for safety, security, environment, and the organization's mission and how it will achieve the goal you are driving for.

Guidance for Measured Indicators of Human Performance

Some examples are provided below from Savannah River Nuclear Solutions (SRNS) and Excel. Most site Contractor Assurance Programs utilize similar tools to convey site level performance indicators. Notable for SRNS is that their Behavior Based Safety observation system is tied into their site corrective action system with specific human error codes related to, in the case of Figure 2, error precursors, which are then reflected in the associated pie charts. The investment necessary to achieve such integration clearly has benefits but is not entirely necessary to begin the process of establishing human performance indicators and reporting trends in your organization.
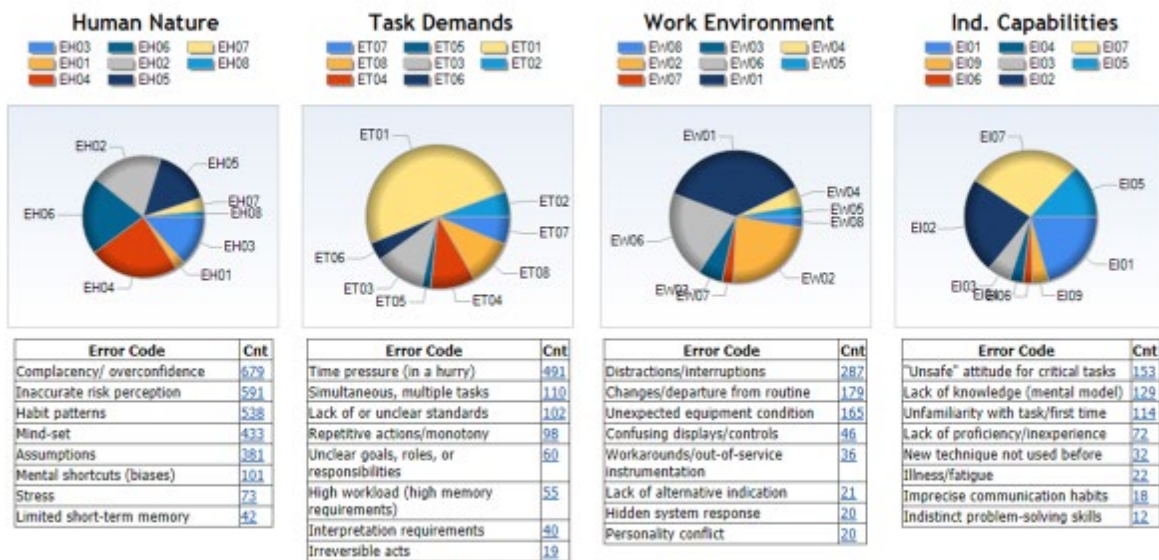
Figure 2 - Example of reporting error precursor data based on Behavior-Based Safety (BBS) Observations

For examples of quantitative information that is <u>poorly</u> designed for communication, visit perceptualedge.com/examples.php. These should be avoided if possible

Often, a simple red, yellow, green indicator method communicates effectively as a quick status of key organizational properties, shown in Figure 3. A potential downside of this method is that a green (meets acceptance criteria) or yellow (caution) can underreport issues at lower levels in the organization. SRNS has employed a red-dot 'halo' indicator to highlight to management that there is more to this area they should be aware of.
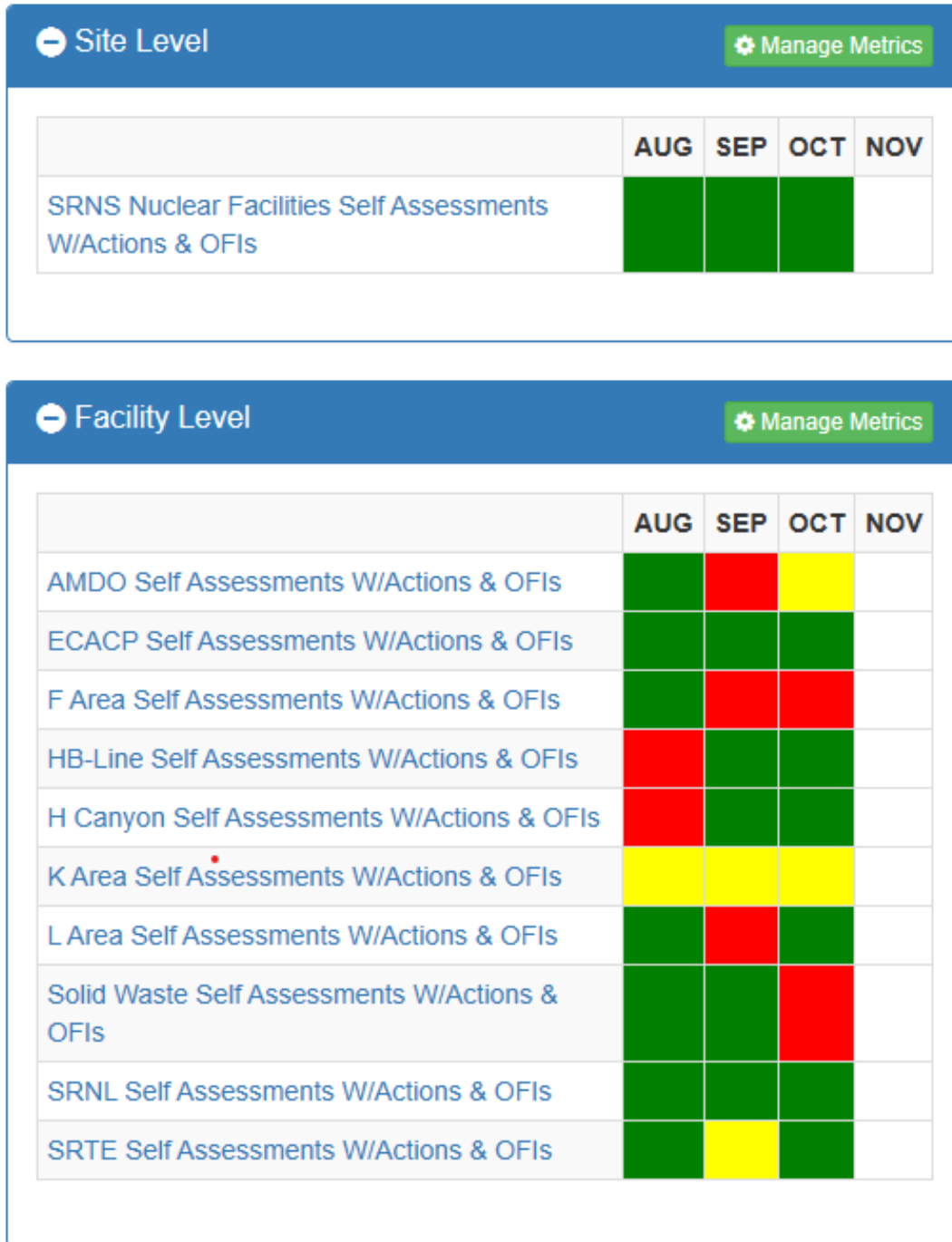
Site Level   ⚙ Manage Metrics

	AUG	SEP	OCT	NOV
SRNS Nuclear Facilities Self Assessments W/Actions & OFIs	🟩	🟩	🟩	

Facility Level   ⚙ Manage Metrics

	AUG	SEP	OCT	NOV
AMDO Self Assessments W/Actions & OFIs	🟩	🟥	🟨	
ECACP Self Assessments W/Actions & OFIs	🟩	🟩	🟩	
F Area Self Assessments W/Actions & OFIs	🟩	🟥	🟩	
HB-Line Self Assessments W/Actions & OFIs	🟥	🟩	🟩	
H Canyon Self Assessments W/Actions & OFIs	🟥	🟩	🟩	
K Area Self Assessments W/Actions & OFIs	🟨	🟨	🟨	
L Area Self Assessments W/Actions & OFIs	🟩	🟥	🟩	
Solid Waste Self Assessments W/Actions & OFIs	🟩	🟩	🟥	
SRNL Self Assessments W/Actions & OFIs	🟩	🟩	🟩	
SRTE Self Assessments W/Actions & OFIs	🟩	🟨	🟩	

Figure 3 - Use of color-coded monthly metrics to communicate status with 'halo' red-dot notice for attention

Another simple method to both analyze and communicate data is use of control charts with upper and lower control limits indicating the bounds of concern, as shown in Figure 4. This type of reporting format can be generated by existing functions in Microsoft Excel to easily show the variation in the human performance metric over time.
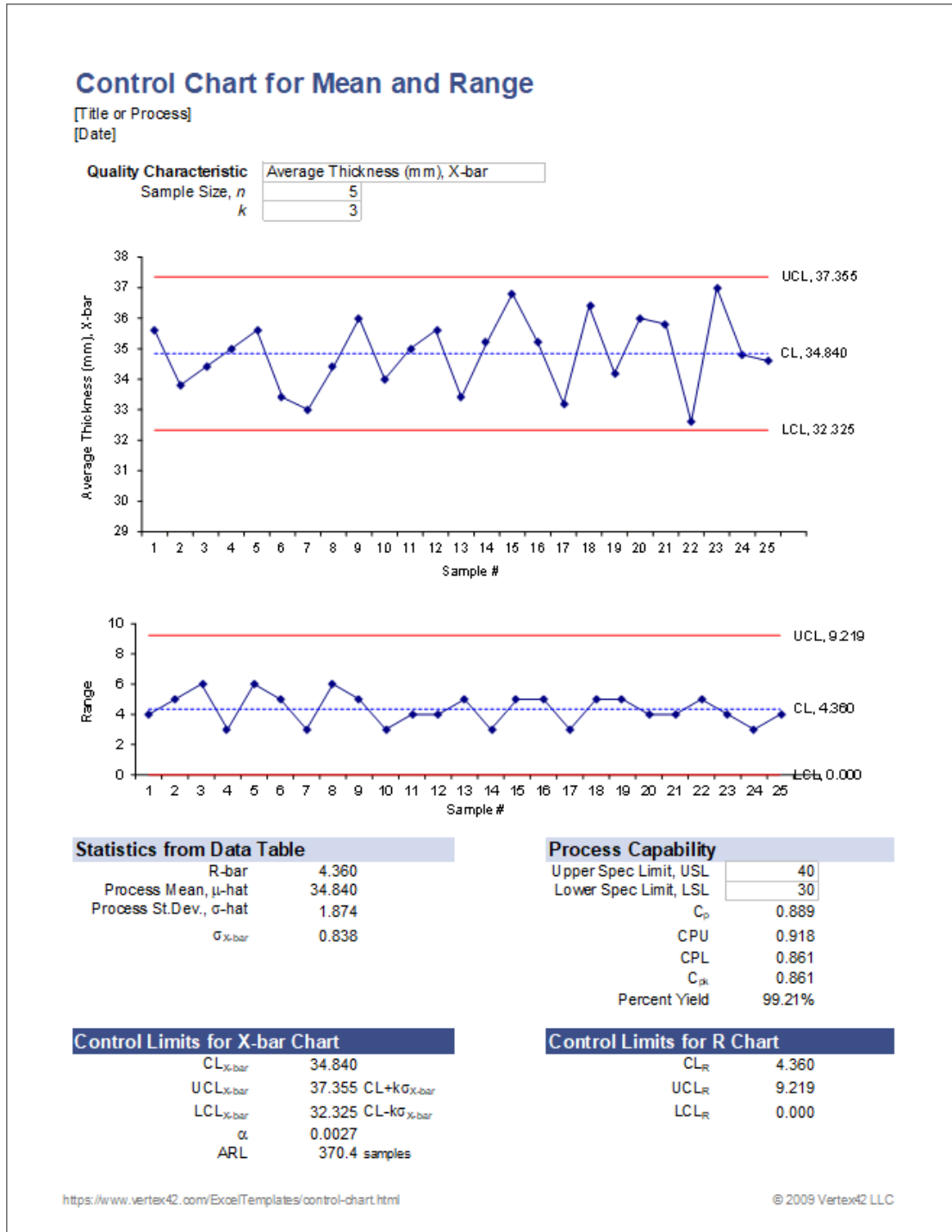

Figure 4 – Control chart capabilities within Microsoft Excel

When determining the best method of communication and disposition pathway of measurements and analysis, it is important to cater to the intended audience. Different layers of management, in charge of different layers of decision making, likely will require/desire different mediums or platforms of presentation. For example, a front-line manager is more likely to want more detailed analysis/results, whereas high-level management likely trusts their subordinates with the details and would like a bigger picture and higher level view of the facts and intended actions. It is recommended that any disposition pathway for metrics and analysis include recommended actions based on observed trends. These actions can be summarized in an analysis section of a dashboard or report.

Before you go to meet with management, always understand your data and its message. Anticipate questions that might be asked and prepare answers to those. However, be prepared to listen first and observe after you present your data; then answer with confidence. Remember that it is important to connect the dots and be transparent so that people being observered as well as managers can see the story, from what was identified to what was changed.

As a final point in this section, Peter Drucker made the argument that management using the Liberal Arts is superior to relying on data alone or data as the primary factor in decision making is confirmed by observation…from being out among staff to gain understanding about the work environment they perform in and the processes used to guide that work.   However, decisions or changes informed by data must be implemented with practice and applied with effective procedures to result in consistently effective results.

6. Managing what is Measured

Sections 3 and 4 discuss the appropriate development of HPI measures that will releate to impovements in practices leaing to improved work outcomes. As part of the effort to manage what is measured, it is important to develop measures with the goal of process or performance improvement in mind. According to Daniels in Ref. 7, goals for performance improvement are antecedents (prompts) for positive reinforcement to achieve the desired outcomes/consequences of the human performance behaviors. In order for management to determine if improvement is occurring, measurements need to be designed to illustrate that.

To manage what is measured, organizations and management must be able to determine and interpret signals from metric analysis that indicate a significant performance trend. Utilizing appropriate charts and analysis techniques will allow one to complete this task more easily. In the interpretation of those trends, there must be focus on gaps between current state and desired state performance. Control charts will help determine if you have steady current state performance and will allow management and data owners to determine an improved performance target based on specifically designed improvement initiatives. If improvement initiatives do not statistically show a positive trend in performance, it is likely that more time needs to go by before lagging effects of improvement initiatives can be realized *or* the effects and significance of the improvement initiatives need to be reevaluated. Even if the effects are lagging, effective improvement initiatives should show performance improvements in the metrics, if the correct performance metrics are being monitored.

As stated in Sections 3 and 4, it is imperative that the selected human performance measures be designed so that management knows what actions to take to address adverse trends appropriately in those areas. Additionally, it is important to use these measures to consistently evaluate performance. Managing what is measured is a key aspect to being a data-informed culture. To do this, metric development must be derived with an organization's strategic goals as the basis. To manage what is measured, the measurements must be key indicators of desired human performance behaviors and outcomes that are directly related to the strategies of the organizations (or processes) that one is attempting to measure and evaluate. Keeping data in context, management must use the knowledge from HPI indicators judiciously and respectfully in the culture they guide as leaders.

The way that performance trends and measurements are communicated to management in charge of decision making is crucial to obtaining maximum value from developed measures. Reference section 4.3for ideas on how to effectively communicate indicators and performance trends to management.

7. Summary and Challenge

Clearly, proper collection and analysis of relevant metrics is a key part of managing performance and achieving contractor assurance goals. Through this, your organization can know where it is achieving timely, quality, accurate outcomes as well as where challenges lie.

An effective set of metrics "*surface an organizations most important work. They focus effort and foster coordination. They link objectives across departments to unify and strengthen the entire company. Along the way, …enhance workplace satisfaction and boost performance and retention*" (Ref. 4). Human performance indicators lie behind the higher objective-level indicators within each part of an organization, either in cross-functional aspects of work performance or within individual disciplines and internal system interfaces.

This document provides guidance in selecting and using human and organizational performance indicators to aid organizations in maintaining awareness of the human performance outcomes which support their ultimate success factor, fulfilling their current and future missions and goals. Good metrics can be compliment a good field observation program (EFCOG Best Practice Guide to Coaching) in that the well-designed dashboard can provide another way to understand where work-as-done differs from work-as-imagined or work-as-planned. Poorly designed metrics can be, at best, minimally effective and, at worst, a resource drain, divisive, and a trust weakener.

- **Effective Metrics selection and development cannot be done in a vacuum**. Collaboration to determine what metrics should be put in place to gauge important human performance-related issues. Ensure a mix of leading and lagging indicators.
- **HPI principles must be kept at the forefront** of what is measured, how it is measured, and how diverging trends from what is expected are understood before solutions are proposed, designed, and implemented.
- **Communication** - From the initial collection of data (*Why are we doing this*?) through analysis of trends, and on to reporting, formulating the metrics message should be founded on solid understanding of the meaning behind the data and the intended audience to receive the information. Understand your organization's preferred communication styles. In the end, this will lead to better general agreement on the path forward to resolve the issue(s), leading to…

- …**Actions** based on the metric results ought to involve those who will be responsible for ensuring it is carried out. Celebrate incremental goal achievement and attentively seek to understand system-related contributors to declines. When necessary, this may involve causal analysis or learning teams to inform the decision making process. This will help ensure success by validating the goal of the action is being addressed.

In the process of adapting this guidance to your organization, you are encouraged to reach out to the EFCOG HPI community and other associated the ISM Working Groups to benchmark and learn best practices which might also work well in achieving the desired outcomes for your organization.

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