LEAN VISUAL MANAGEMENT FOR EFFECTIVE BUSINESS PROBLEM-SOLVING

A lean visual management system starts with the process of analyzing details and data before examining the overall financial statement impact.

GARY KAPANOWSKI

The principle of lean visual management can be summarized by a Rod Stewart lyric: "So remember, every picture tells a story, don't it."[1]

Visual management of data is a growing area of concern for organizations. With more and more data being collected, the ability to quickly understand what is occurring at each process becomes a priority. The goal is to turn analytics into an organizational strength by using lean principles and techniques for root cause analysis and problem-solving. In this article, we examine reasons to employ visual management, which include one of the lean principles from the Toyota Production System (TPS), the goal of visual management, and the proper use of 5S for organizations and data. This article also provides specific examples of proven lean visual management techniques needed for efficient and effective analysis. Just as the balanced scorecard (BSC) is a visual system that looks at the organization from 30,000 feet before zooming in to the details, the lean visual management system starts with the process of looking at the details before examining the overall financial statement impact.

TPS principle seven: Use visual control for cost transparency

A good visual indicator is like a traffic light: It is understood immediately at any speed or from any direction. Another element of a good visual system is the ability to identify both value-added work and non–value added work (waste). With clear visual standards, anyone should be able to walk through a work area and determine if it is being managed effectively. Recognizing variation from a standard or target in a process will assist in

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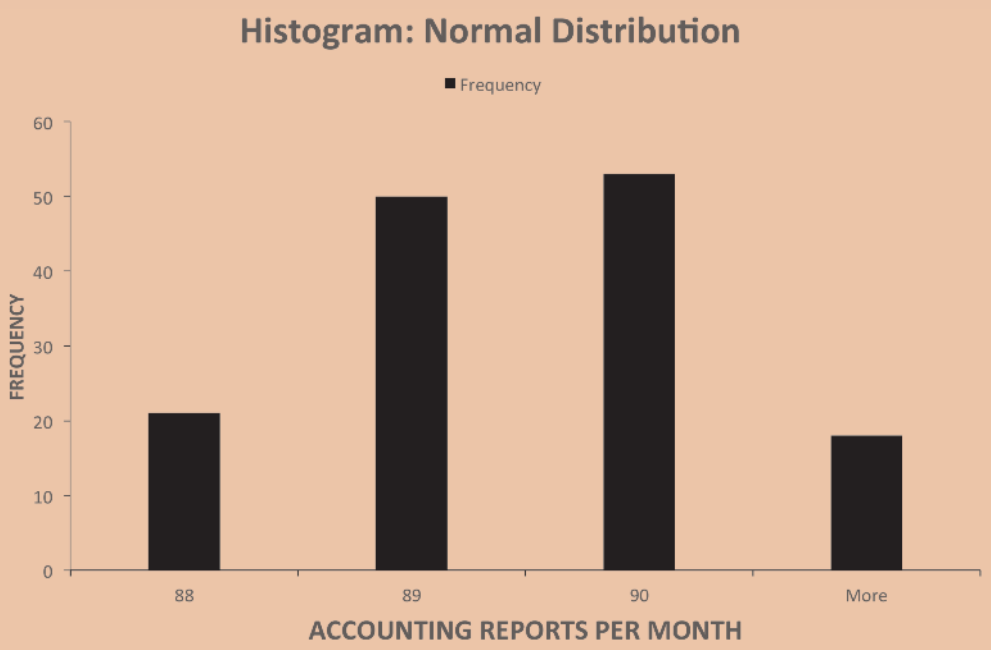
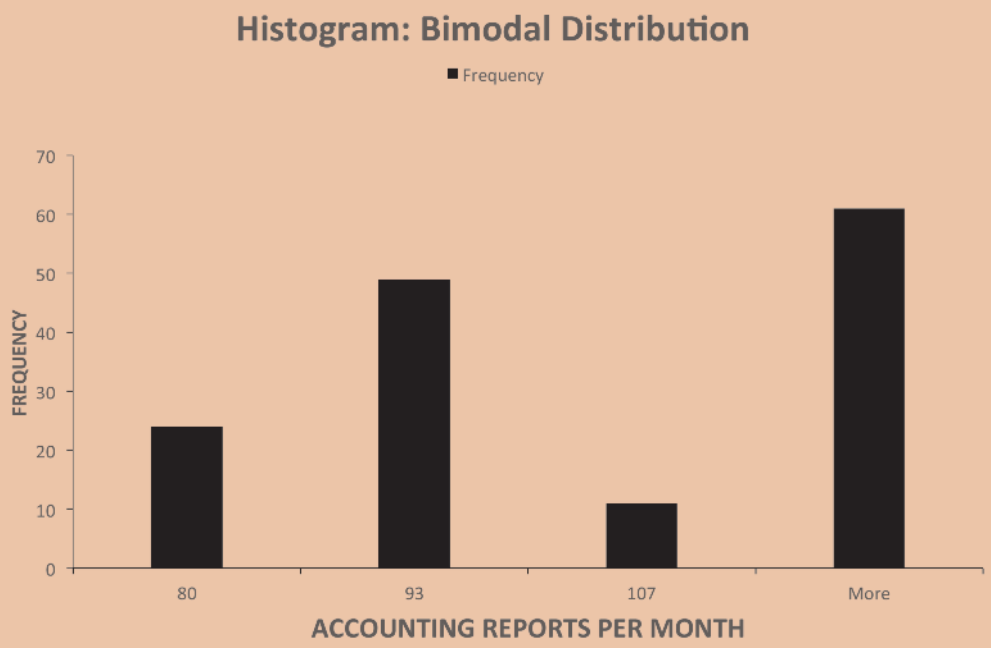
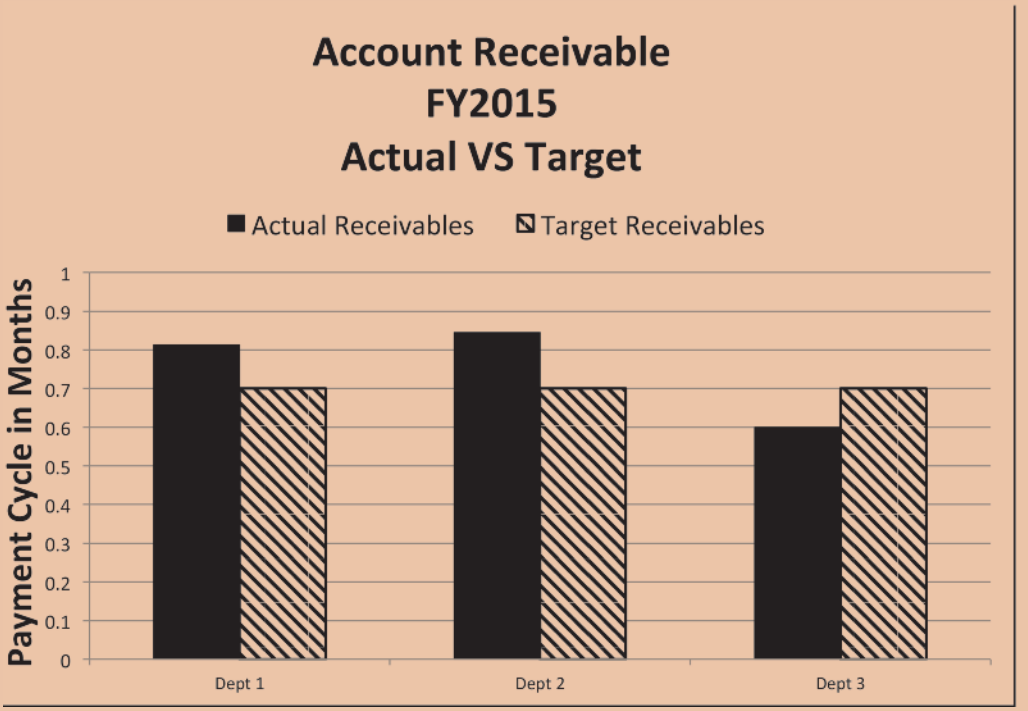
EXHIBIT 1 Histogram





waste identification and elimination; this is the value driver for each visual chart. Lastly, updated charts and graphs, such as the 5 Whys and fishbone diagrams, allow for visual control to improve the flow of products and information for fast decision-making and problem-solving. Thus, a transparent and waste-free work environment is the goal for any lean organization, as it allows workers to immediately see how well they are doing. This ensures fast and proper execution of operations and procedures and the translation of charts and graphs into a

EXHIBIT 2 Bar Chart Variance Analysis



financial impact amount that assists management with business decisions.

The goal of visual management

In order to have continuous improvement, a lean environment is needed to produce the expected results. The five principles of visual management are:

1. Create an environment in which problems are not tolerated;
2. Have all employees develop problem-solving skills;
3. Use visual techniques to make abnormal conditions stand out;
4. Address problems immediately; and
5. Use the scientific method of plan, do, check, and act to prevent recurrence.

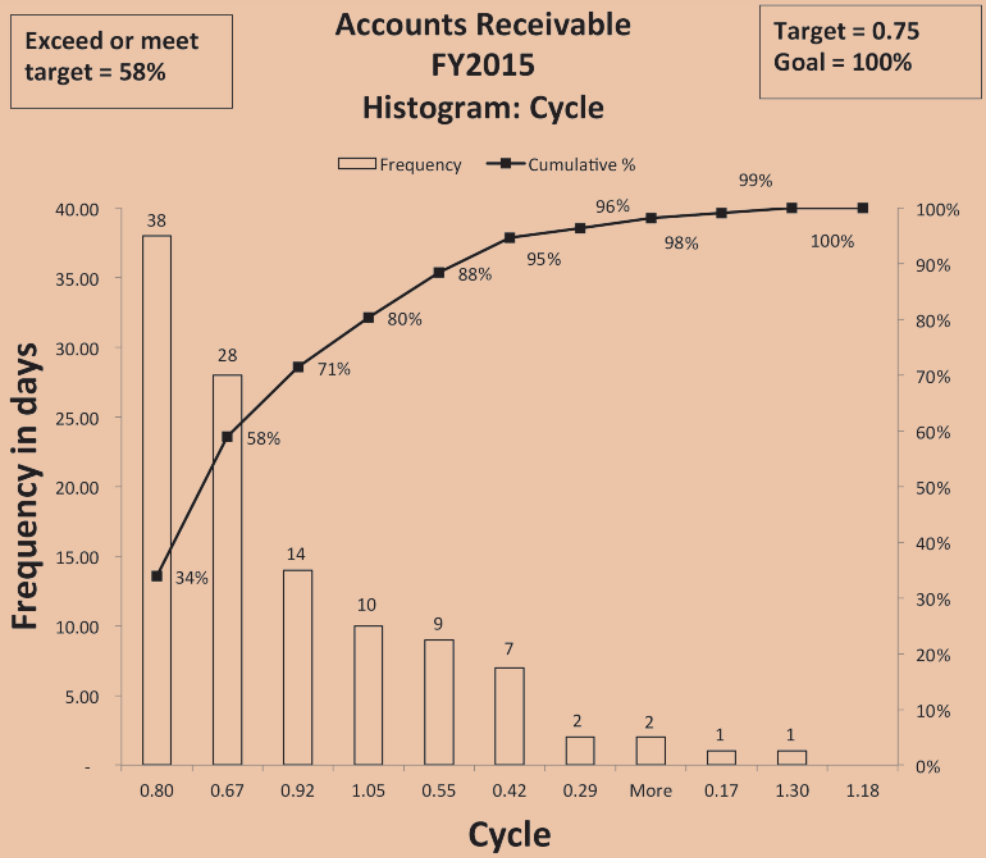
In summary, visual management places all tools, parts, production activities, and indicators of production system performance, including organizational processes like accounts receivable, in plain view. We move quickly to solve problems by eliminating waste, which will improve workplace efficiency through better organization and enable detection of the abnormal conditions at a glance.

The proper use of 5S for organizations and data

In order to implement visual management, establish a smooth flow of products and information, and expose problems in the processes, lean systems use 5S first to provide control and eliminate waste in a process and/or workplace. This does not mean just cleaning up a work area; it also includes organizing the work area to include only value-added items and eliminate any non–value added items. Thus, 5S is a visual indicator that quickly and easily determines whether all value-added items are present so that any knowledge worker can perform his or her task when needed. Anything else is considered waste; this is the rationale for 5S. It's the building block for any lean system.

In his book *The Toyota Way: 14 Management Principles from the World's Great-*

EXHIBIT 3 Pareto Analysis Chart



est Manufacturer, Jeffrey Liker describes the following five steps of the 5S system:

1. Sort: In the work area, keep only what is needed and eliminate what is not needed;
2. Straighten: Make a place for everything and keep everything in its place;
3. Shine: Clean and inspect for abnormalities and conditions that could produce poor quality;
4. Standardize: Develop systems and procedures to maintain and monitor the previous process steps; and
5. Sustain: Maintain a stabilized workplace in an ongoing process of continuous improvement.[2]

Many of us have been through a workplace 5S implementation, but many have not experienced a 5S of data utilization. This can be implemented quickly without much added work by using the following categories:

- clean data for the organization;
- network;
- spreadsheet; and
- sensitivity to critical path (risk).

Clean data for the organization. The goal is to make the data usable for the next user (customer). This involves communication with the next user to make clear what is expected of the data and analysis. Standardize any queries once the process is determined to be repeatable and reliable for the customer. Finally, use only what is needed and eliminate unnecessary data.

Network. The goal is to make files easy to find by establishing naming conventions, such as standard file-folder nomenclature and locations. This includes placing non-active files in an archive folder and eliminating obsolete files.

Spreadsheet. Communicating information with Excel spreadsheets is common, but standardizing the process is

not. There are some quick techniques to help with this process. For every spreadsheet, include the following:

- Answer tab: Have a single tab that includes only the information that will be needed by the next user. Any backup data can be placed in a separate tab in case they are needed in some capacity;
- Data tab: This is the common core area of stored data for everyone to utilize in order to make charts and graphs;
- Storing: Standard file names allow for an easy search;
- Information tab: This documents when the data were extracted, by whom, and why. Any update for the data (and the reason for the update) is recorded each time the file is saved. Assumptions used in the file are described for any user to understand. This includes color codes for sales, cost, gross margin, etc.; and
- Protection: Protect data with passwords by tab or file.

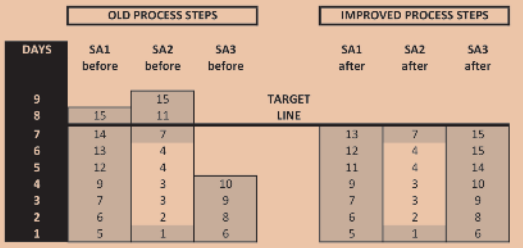
Sensitivity to critical path (risk). The goals and key performance indicators of the organization are closely watched and kept transparent. By recognizing how a percentage change will affect the financial performance of the organization, any deviation from the target or business plan, along with top/bottom line implications, will be clearly understood. This information can be communicated through data tables or what-if scenarios in Excel.

Specific examples of lean visual management techniques

Lean visual management is a systematic approach that uses charts and graphs to understand data. By following this methodology, you can understand the process and apply proper lean techniques to make the process effective and efficient (i.e., in control). The following are specific ways to visualize the data in order to make proper management decisions:

- histograms;
- bar chart variance analysis;
- Pareto analysis charts;
- stacked workload balance charts;
- run charts;
- control charts;
- first-time yield;
- radar charts;
- variance standard run charts;
- *kanban* reporting boards; and
- scatter graph plots.

EXHIBIT 4 Stacked Workload Balance Chart



STEP	TASK DESCRIPTION	MONTH TOTAL TIME DAYS	VALUE-ADDED (VA) / NON– VALUE ADDED (NVA)
1	RECEIVE APPROVAL FOR INVOICE TO CUSTOMER	1	NVA
2	ISSUE INVOICE TO CUSTOMER	1	VA
3	RECORD INVOICE TO CUSTOMER	2	VA
4	RECORD INVOICE PAYMENT BY CUSTOMER	2	VA
5	REVIEW AGING FOR PAST DUE	1	NVA
6	CONTACT PAST DUE ACCOUNTS >$	2	NVA
7	CONTACT PAST DUE ACCOUNTS > DATE TARGET	2	NVA
8	VALIDATE ANY DISCREPANCIES REGARDING NON-PAYMENT	1	NVA
9	FIX ANY DISCREPANCIES REGARDING NON-PAYMENT	2	NVA
10	RECORD ANY DISCREPANCIES REGARDING NON-PAYMENT	1	NVA
11	RECEIVE VALIDATION FOR PAYMENT ON PAST DUE ACCOUNTS	1	NVA
12	ISSUE ACCOUNT HOLD ON ANY PAST DUE ACCOUNTS	1	NVA
13	REVIEW ALL ACCOUNT HOLDS AND RECORD	1	NVA
14	PREPARE MONTHLY REVIEW CHARTS AND INFORMATION	1	NVA
15	FOLLOW UP ON ANY ANALYSIS FROM MONTHLY REVIEW	2	NVA

Histograms

I like to call this the Instagram of data. By evaluating the distribution of a set of data, we can determine if the process is in control or lean. Data points centered near the average are considered a normal distribution. Data points not centered near the average can be skewed and indicate inadequate measuring methods. Data points that focus on two peaks, or a bimodal distribution, may indicate two distinct processes at play. A review of standard work procedures will produce immediate results. Overall, this is a quick estimate of the center, spread, and shape of the process, which can be used for predicting future performance. See Exhibit 1.

EXHIBIT 5 Run Chart

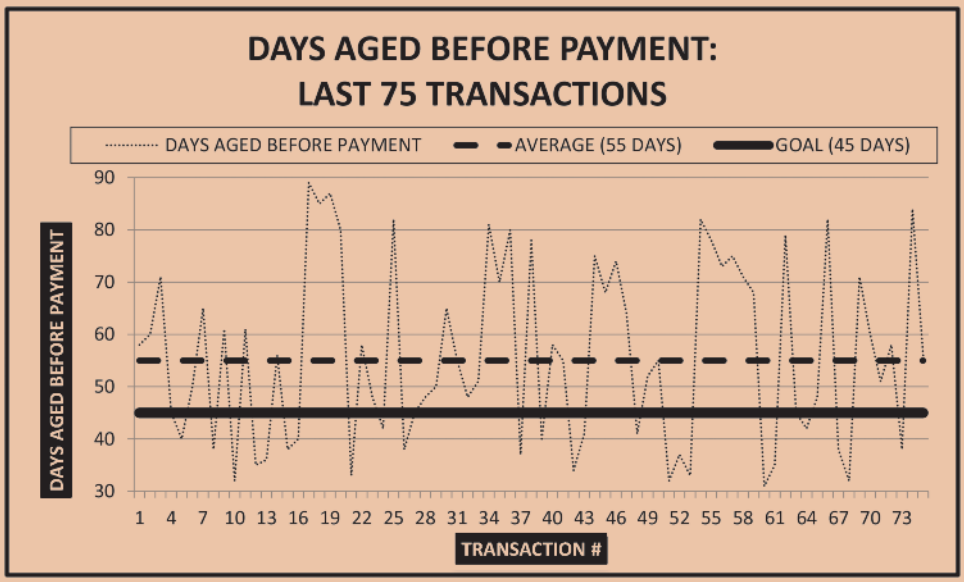


EXHIBIT 6 Control Chart

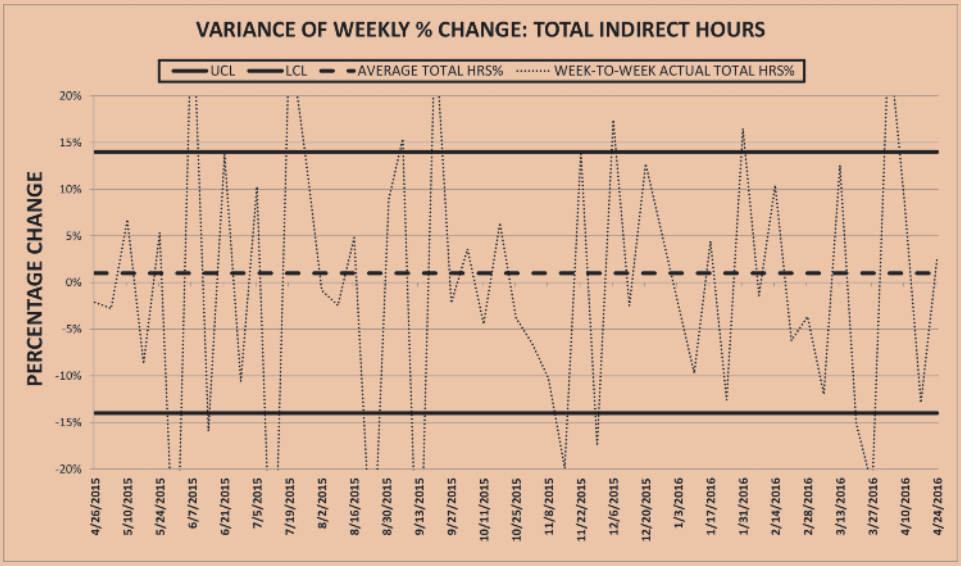


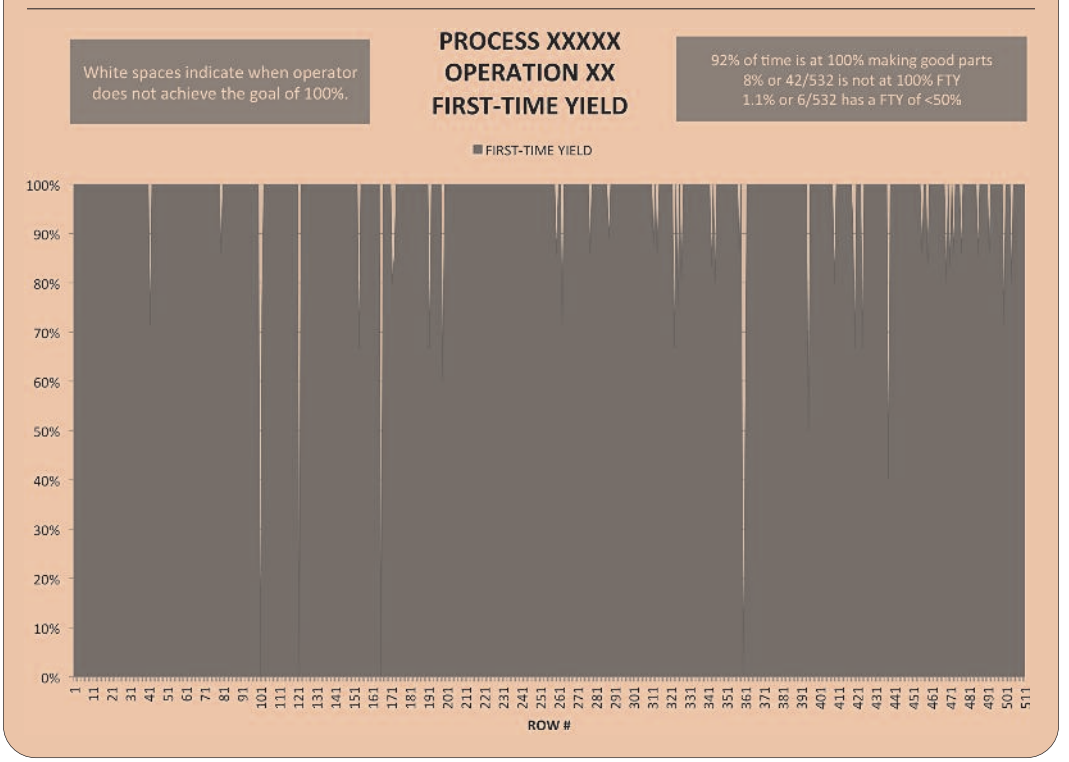
Chart analysis. The normal distribution indicates that the accounting reports printed each month are near the average, which means the process is in control (or lean). The bimodal chart reflects several processes performed by the accounting department. Standard work is required to return the process to a normal distribution.

Bar chart variance analysis

A simple comparison of actual data to standard or target data will clearly indicate whether the current state of the process is in control and if any action is needed to bring the process back on track to the standard or target.

Chart analysis. The chart in Exhibit 2 shows departments one and two performing

EXHIBIT 7 First-time Yield



above the target receivable level, while department three falls below the target. The focus of the improvement will be on department three's process of collection.

Pareto analysis charts

The ability to detect trends and significant changes in a combination chart is a powerful tool. The Pareto analysis chart focuses on the "vital few" to break down big problems into smaller pieces and identify the biggest contributors. Basically, 80 percent of the effects or problems come from 20 percent of the causes. Also, comparing the actual results to the standard indicates by what percentage the process has met and/or exceeded the metric. Anything below 100 percent indicates the process's failure to reach the standard. The process is not fully repeatable and reliable and thus requires improvement.

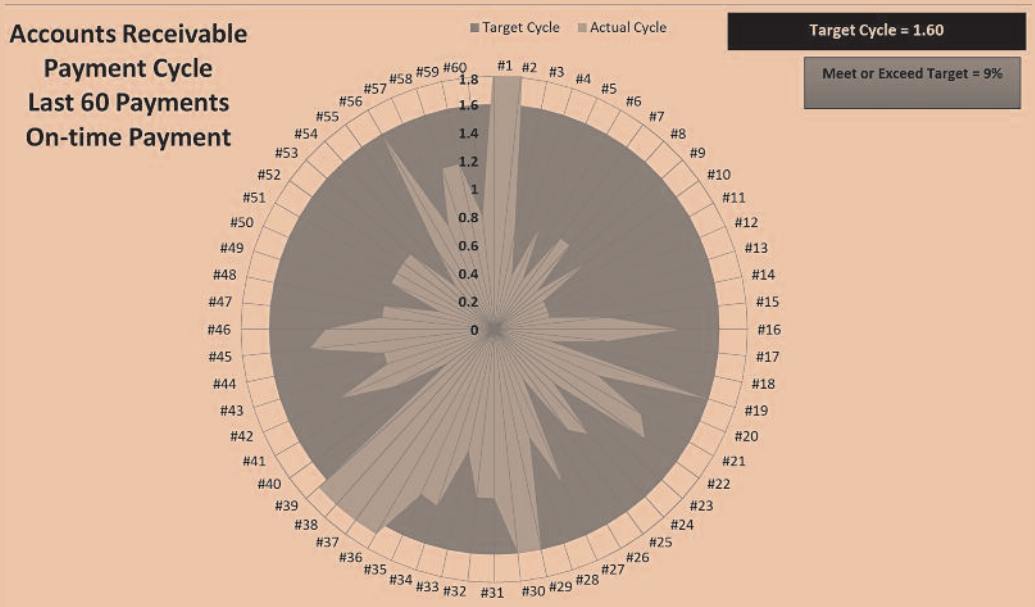
Chart analysis. The chart in Exhibit 3 shows that the accounts receivable cycle of collection is operating at 58 percent of the target, or, in other words, 42 percent of the time payment is not being collected on time. The goal is to be at 100 percent on time. We can calculate the annual cost of not being at 100 percent collection based on these data.

Stacked workload balance charts

Stacked workload balance charts are a great way to express the level of engagement of an activity or process in units of time or percentage. In a lean environment, the chart will provide the user with three continuous improvement tasks: (1) eliminate waste by identifying the non–value added tasks to be removed from the requirements; (2) balance workloads to help identify the rearrangement of tasks to allow for better task distribution; and (3) improve workflow by using a detailed visual indicator of where standard instructions and cross-training can assist the process and avoid bottlenecks or stoppages. By placing a line for the target cycle time, we clearly identify the time that cannot be exceeded, or we run the risk of not meeting schedule.

Chart analysis. In our example in Exhibit 4, we are reviewing the accounts receivable process for three accountants and

EXHIBIT 8 Radar Chart



their responsibilities. This process contains 21 days of responsibilities: staff accountant one (SA1) with 8 days of responsibilities; staff accountant two (SA2) with 9 days of responsibilities; and staff accountant three (SA3) with 4 days of responsibilities. The team added the classification of value-added and non–value added work to identify tasks that should be eliminated when possible. In our example, the elimination of tasks will be evaluated in the next improvement implementation. Because we have 21 task days to complete with 3 people doing the work, we can redistribute the work by establishing a basic target of 7 days per person (21 days divided by 3 people). During the redistribution of work, the workflow is evaluated in order to optimize the time of the staff accountants and the customers utilizing this information. To implement cross-training, the new established tasks are organized so that everyone in the group performs them. Over a period of time, such as six months or one year, the workloads can be switched so that everyone can participate in each task over a specified amount of time. In our example, we could implement a 6-month cross-training to allow all 3 accountants to experience each process step once over 18 months.

Run charts

Run charts are used to detect trends and significant changes in a process. By comparing the business process activity to a goal or standard, we can determine if the variation indicates waste that needs to be eliminated. Some ideas to consider for additional analysis on these data include:

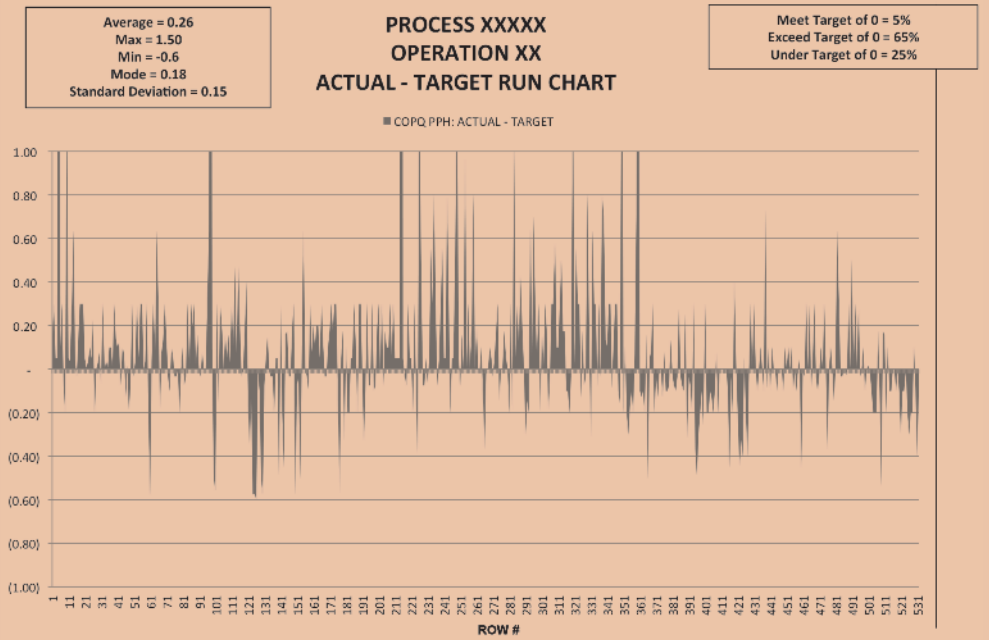
- average response time;
- percentage above/below the average;
- number of "runs" all above or all below the average;
- distribution of the data; and
- any special causes.

Chart analysis. The chart in Exhibit 5 shows how many days receivable accounts have aged before payment, allowing the analyst to clearly see a pattern of payment. Anything above the goal is a negative condition. This chart signifies that there are many transactions above the goal and warrants a deeper investigation into those specific occurrences.

Control charts

This is a run chart with added features, such as the average and control limits, to provide visual details of the area that indicates a normal distribution (i.e., the process is in control or lean). This will

EXHIBIT 9 Variance Standard Run Chart



help establish a measurement baseline, process stability and predictability, a long-term monitoring process, and confirmation of the impact of process improvement activities (very important in lean organizations). The control chart is one of the most important visual techniques available to the user.

Chart analysis. The chart in Exhibit 6 shows the weekly percentage change for indirect hours charged. In a controlled environment, the goal is to experience a zero percent change, indicating an even flow of operations. To signify a normal distribution, the upper and lower control levels are indicated on the chart. This is calculated by using the average and adding three times the standard deviation for the upper control limit. The lower control limit is calculated using the average and subtracting three times the standard deviation. In our chart analysis for the past year, there are many occurrences that exceed the control limits; thus, the process is not in a normal distribution or in control (lean). We can compare this analysis with production details to identify ways to improve the process with workload level balancing.

EXHIBIT 10 *Kanban* Reporting Board

TO DO	DOING	DONE
TASK#1	TASK#3	TASK#4
TASK#2		TASK#6
TASK#5		
TASK#7		
TASK#9	TASK#10	TASK#8
	TASK#11	TASK#12

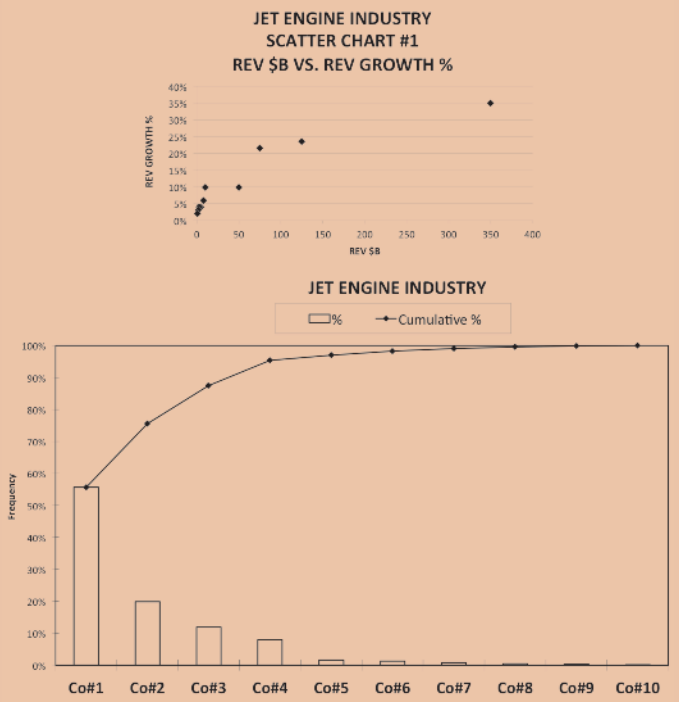
TASK BOARD		
TASK#1	EMPLOYEE #1	COMMENTS
TASK#2	EMPLOYEE #1	COMMENTS
TASK#3	EMPLOYEE #1	COMMENTS
TASK#4	EMPLOYEE #1	COMMENTS
TASK#5	EMPLOYEE #1	COMMENTS
TASK#6	EMPLOYEE #1	COMMENTS
TASK#7	EMPLOYEE #1	COMMENTS
TASK#8	EMPLOYEE #2	COMMENTS
TASK#9	EMPLOYEE #2	COMMENTS
TASK#10	EMPLOYEE #2	COMMENTS
TASK#11	EMPLOYEE #3	COMMENTS
TASK#12	EMPLOYEE #3	COMMENTS

First-time yield

This chart indicates quality at each individual process step. By not performing at 100 percent, the hidden factory costs of rework or scrap are clearly indicated.

Chart analysis. In Exhibit 7, the dark background of the chart indicates when the

EXHIBIT 11 Scatter Graph Plot



operation performs without defect (by percentage). The white vertical bars indicate defect. The analyst can review these situations in detail to determine whether additional analysis is required. Also, the analyst can calculate the cost of this performance level and the defect cost of future operations if not corrected.

Radar charts

The area-style chart (such as the one shown in Exhibit 8) will provide another view of a data series compared to a target. It will show if the performance meets the target, and the analyst will calculate what percentage of time this condition is met. Due to the graphical nature, patterns can be visualized to spot trends.

Chart analysis. The chart in Exhibit 8 points to an underperforming accounts receivable process in which the target is achieved only 9 percent of the time. The sequencing of the data points in "runs" tends to achieve target in runs 36–39. This is used to help the analyst better understand the process and where to concentrate in order to improve the process. It also assists the analyst in calculating the cost of underperformance.

Variance standard run charts

This chart attempts to normalize the data set by subtracting the actual result from the standard or target. The goal is to have no variance or a result of zero. Anything not zero is variance performing over or under the goal. This will quickly determine whether the process is in control or lean and whether the established target is appropriate for the process. See Exhibit 9.

Chart analysis. The data report the variance of the operation when compared to the target goal of zero. By reviewing the trends, the analyst can see if the operation is under control (or zero). The analyst can also determine whether the target is too low or too high based on the overall performance average or frequency of the occurrences above or below the *x*-axis. In our example in Exhibit 9, the data exceeded the target of zero by 65 percent. This may warrant a review of the operational standard to which we are comparing our actual time. The chart also indicates abnormalities that should be investigated, as there could be issues with the validity of the data collection or reporting. This can be seen on the chart itself or by the fact that the maximum variance is 1.5 (more than five times the average).

Kanban reporting boards

The process uses a *kanban* board to categorize tasks as "to do," "doing," and "done" for a work area (as shown in Exhibit 10). Tasks are visual, using color codes (usually with sticky notes) by person, department, difficulty, or any other measure. Tasks are moved on the board by the "responsibility center" or the user of the task in real time. The details on the board are only what is needed and it is thus very concise. The board should be easy to understand and indicative of what needs to be completed. In the office, this can be utilized for month-end or

year-end activities, including financial audits or a specific financial project.

Chart analysis. The *kanban* reporting board will visually communicate the current performance of any project to anyone viewing the information. The number of tasks in each area (to do, doing, and done) can provide valuable details of the project's status without much additional analysis. In the example in Exhibit 10, 42 percent is left to do, 25 percent is doing, and 33 percent is done (or 67 percent to be completed). Employee one has 57 percent to do, 14 doing, and 29 percent done (or 71 percent to be completed). This visual chart will help the team achieve its goal of completing the project on time and stay flexible based on the information. In our case, the team may wish to help employee one start several of the "to do" tasks and complete the "doing" task.

Scatter graph plots

Comparing two specific key performance indicators will indicate how the organization compares to the standard or industry baselines. By looking at five or more key metrics from the BSC in a variety of scatter plots and organized for patterns and relevance, we can verify that the organization is upholding the stated mission, vision, and goals.

Chart analysis. The chart in Exhibit 11 points to one data point in the top right section — the ideal situation for these two key metrics and a significant advantage. The analyst can then review additional comparisons for similar results to determine if this is a sustainable competitive advantage. The overall performance of the multiple scatter charts is displayed in a Pareto chart, which in our example indicates a clear separation of performance from company one to company two and the rest of the field.

Conclusion

A lean visual management system can assist your organization in root cause analysis and problem-solving in order to reduce waste quickly. This article introduces different types of visual charts and graphs that can be used in any process, as well as how to decipher the details in order to reduce waste, improve the process, and calculate the financial impact of variation. I hope this provides a clear path to implementing a lean visual management system for your organization.[3] ■

NOTES

[1] Stewart, R. and Wood, R. (1971). Every picture tells a story [Recorded by Rod Stewart]. On *Every Picture Tells a Story* [CD]. Mercury Records.

[2] Liker, J., *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer.* (New York: McGraw-Hill Education, 2004).

[3] All charts and graphs used in this article employed concepts from the following references: Womack, J.P. and Jones, D.T., *Lean Thinking: Banish Waste and Create Wealth in Your Corporation.* (New York: Free Press, 2003); Imai, M., *Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy.* 2nd ed., (New York: McGraw-Hill Education, 2012); Kaplan, R.S. and Norton, D.P., *The Balanced Scorecard: Translating Strategy into Action.* (Boston: Harvard Business Review Press, 1996); Kapanowski, G., Lean fundamentals for accountants, *Cost Management* 30, no. 1 (2016): 5–14; Drucker, P.F., *The Practice of Management.* (New York: HarperBusiness, 2006).