Changing from watermelon measures to real decision support: including information about variation in performance measurements

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Summary Abstract

This paper describes a case study using an action research approach studying the change of performance measurement review in two management teams at a large international company. The visualization of performance measurements is changed from only showing if the target is met (red and green figures) into displaying variation over time by using control charts. Several advantages, e.g. predictability and guidance of suitable actions, occurred. Important concepts in the underlying system to consider, being able to make this transformation are: quality of data, to understand the concept of variation and to train a team as a team.

Keywords: Performance, Measurement, Variation

Introduction

Everyone knows that average Joe does not exist, and that decisions need to be founded on a wider base. How come that we still use average key performance indicators (KPIs) as our major base for business and operational decisions? Do we understand as individuals? Probably. Do we understand as a group? Maybe not.

This paper describes a case study researching the change of performance measuring at a large international company. The performance measurements are changed from only showing if the target is met (red and green figures) into displaying variation over time by using control charts.

Bourne (2008) describes the ineffective way corporate performance is being reviewed as one of the main issues for practitioners. Among others Deming (1994) and Wheeler (2000) described the importance of taking variation into account when analyzing a company's performance. Roth (2005) and Danielsson and Holgård (2010) as well give examples of using control charts for the purpose of displaying variation in

key performance indicators (KPIs). Even though proven useful, these methods are not as widespread as they could be within the industry. Wilcox and Bourne (2003) state that early work on performance measurement by Shewhart (1931), later recognized by Deming (1994) and Wheeler (2000), has been overlooked by recent authors and lost the emphasis on prediction. A literature review and case studies described by Ericson Öberg et al (2016) show an absence concerning variation tracking and analysis when monitoring KPIs. Variation is therefore not considered to the extent which is necessary for making the right decisions.

In the currently used performance measurement system at the case company the KPIs are mainly displayed as red or green figures, depending on whether the set targets are met or not. The information conveyed by these two colors is limited. A manager at the case company talks about "watermelon measures" (green on the outside but red on the inside) meaning that there might be issues in the production system that are hidden when using this kind of binary way of following-up performance.

The objective of this case study is to develop and test an alternative performance measurement review for selected KPIs with the purpose of displaying variations. Since the research is conducted as action research there are two goals; to solve a problem and contribute to science. The contribution of the research to practice is improved decision-making when taking variation into account (Wheeler, 2000; Deming, 1994). The academic contribution is added knowledge, formulated as a research question:

> *Would interactive workshops including alternative reports of KPIs enable the use of control charts on operational measures?*

Joint understanding of variation, created together as a team, has proven to be a necessary component for its success (Ericson Öberg, 2013). The differences between the current and alternative system, as well as pros and cons are evaluated.

The paper will first introduce the methodology used followed by the empirical case studies of introducing an alternative report. After that the findings are presented. The paper concludes with a discussion and ideas for future research.

Methodology

The proposed changes in performance measurement principles are empirically tested at a large, international automotive company. The research is conducted as a revelatory multiple-case study (two management teams) with embedded units of analysis (different key performance indicators) in accordance to Yin (2009). The research approach has interactive characteristics according to Larsson's definitions (Larsson, 2006) where the researcher introduces solutions to the participating company and thereby enabling joint learning to occur. Research in production and operations management has experienced difficulties to produce results relevant to practitioners, applicable to unstructured issues and contributions to theory according to Westbrook (1995) and he claims action research to be a way to overcome this. The research has therefore been conducted as action research, following the steps described by Coughlan and Coghlan (2002). The process is visualized in Figure 1. In the data gathering step the current KPI follow-up material was collected. In the workshop the data was displayed both as in the current review and by using control charts. The participants did analysis of the differently visualized KPIs and planned suitable actions. The implementation and evaluation steps are currently ongoing.

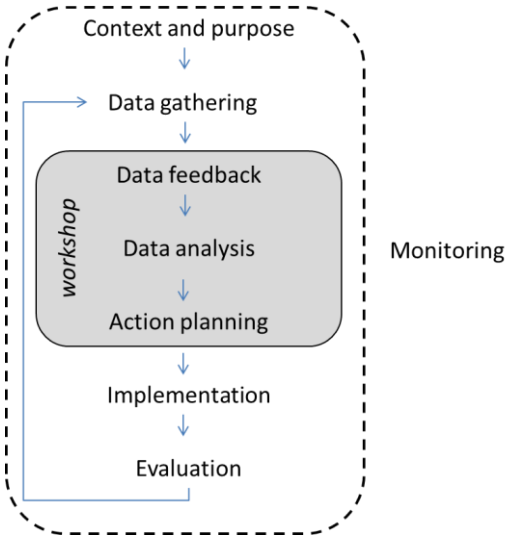

Figure 1 - Illustration of the different steps in the action research process.

The entire process was monitored by three researchers. The main action researcher, the change agent, is employed at the company being involved in the study. That enables a thorough access to data and forums otherwise impossible.

Before the workshops, the participants answered a few questions about their opinion regarding the current KPI review process. The entire one-hour workshop was recorded. The audio file was transcribed into a word document before analysis.

Alternative report

Performance is measured at all plants of the company around the globe and is reported into a system with a standardized set of key performance indicators. These performance measures are used for making important strategic decisions. As stated before, the status of the KPI is shown as red or green depending on whether the target is met or not as illustrated in Figure 2.

Figure 2 - KPI result shown as red or green.

Decisions are drawn from a mean calculation of the KPI, implying that the underlying distribution is symmetrical. Neither variation nor trend is considered when deciding if the figure is red or green. There is a clear lack of information in relation to what is needed to make well informed strategic decisions.

An alternative report is created for the chosen key performance indicators, with the

purpose of displaying the variation by visualizing the KPI in a control chart, see Figure 3.

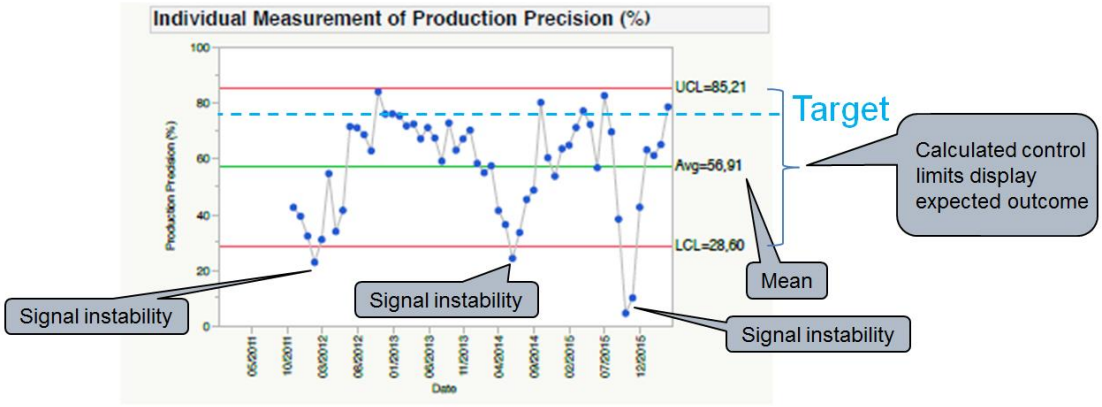

Figure 3 - Example of visualization using control chart.

A decision support considering stability and variation is thereby formed. The differences between the currently used system and the proposed alternative report are evaluated. The workshop included three sections; discussion of KPIs in the current system, short introduction to variation and control charts, and discussion of alternative report with KPIs visualized in control charts. Two workshops were conducted. The first one included the plant management team (PMT) and the second the regional management team (RMT).

The main differences between the current and alternative system are:

- The current system is displaying the individual result compared to the target, as red or green. The alternative system is displaying the result as historical time series.
- The current system displays achievement of target whereas the alternative visualizes the outcome compared to the target as well as statistically calculated control limits indicating what result to predict
- The current system is displaying a mean value whereas the alternative report visualizes both mean value and spread for the individual data points

Findings

The survey conducted prior to the workshop indicates that the expectations of the KPI review in the PMT and RMT were similar. Generally, they expect to focus on KPIs deviating from target and actions initiated to achieve them. In the PMT the atmosphere perceived has improved and is by most experienced as good. Variation as a concept has been raised to the PMT earlier. In the RMT it can differ between the reporting plants; some see it as a must-do while others take it as an opportunity to empower their management teams letting them take responsibility. The KPI-review includes more reporting than decision-making, in both PMT and RMT. Decisions usually taken are in form of identified actions, in cases where the goals are not achieved.

The workshop with the PMT led to that a discrepancy in the KPI definition between the plant and the region was revealed when the variation details were studied, which had been hidden by the normal aggregation of averages. The definition used at the region included one additional lead time day compared to what was included at the plant. The

consequence was that the plant had set a target value based on their definition but was followed up by the regional definition, making it almost impossible for them to reach the target.

The workshop result monitored by the researchers is summarized in Table 1.

Table 1 - Workshop result

Theme	**Plant management team**	**Regional management team**
Present situation	• Focus on achieving target value • When deviates from target important to show actions • Individuals use terms connected to variation and stability even though control charts are not displayed	• Focus on achieving target value • Looking for causes of deviations in the individual points • Individuals ask for e.g. time series plot instead of two-point-comparison
Definitions	• Previous work to create concordant definitions in quality measures have been implemented • Discrepancy in definition between plant and region for one measure	• Uncertainty about definition of stability and reliability
Discussions after introducing control charts	• Insight that the target was not reached, not even for one single month • Reflects on behavior	• Connects that conducted actions affect variation outcome • Easier to predict performance • Pointing forward
Reflections of future use	• Use control charts in the analysis • Change what will affect if the measurement is red or green	• Use control charts in target setting and follow-up • Test control charts on selected KPIs
Example of comments from the participants during the workshop	• "Even if we don't have it in control charts we interpret it in the same way" • "For overview it is sufficient with red or green" • "I would like to have both, to use control charts in the analysis"	• "This is spot on, much, much better." • "More fact based." • "This can help us go forward." • "This seems like a better way."

The workshops show that it is possible to display the variation for the chosen KPIs by using control charts. The discussion in the management teams when using the alternative report focuses on the process monitored, its variation and any signs of instability. Deviations were seen connected in the underlying system when the variation pattern revealed its behavior over time. This reinforced the team to create a joint understanding forming a base for the future oriented discussion. The alternative report was experienced as a better decision support by the managers, since it included more

information about the process and its behavior that created more precise indications of what actions to take. The RMT was generally more positive to the alternative report than the PMT. Both PMT and RMT mention what they call a month fixation in the company as something negative, potentially hindering the alternative follow-up.

Discussion

The research conducted has a large relevance in academic sense by providing an opportunity to study, interact and influence when changing a company's performance measurement system. It better reflects a bottom-up understanding of the current organizational/process behaviors, which forms a richer sounding board for the joint strategic discussion. This situation is normally inaccessible to many researchers. The choice of using action research was therefore necessary. The contribution to practice is significant. Previous studies visualizing KPIs using control charts show improvement of the KPI itself due to improved decision making (Ericson Öberg, 2013). To make the right decisions of course has very high influence on the company's cost and productivity.

The current situation is highly influenced by assuring actions are made when KPIs are deviating from target. That may be interpreted as if deviations are seen as 'unique single events' without correlation or connection. This leads to a locked-in reactive behavior that rather conserves old habits than challenging them, driving continuous improvements. Conclusions from the survey and monitoring during the workshops indicate that the situation is the same in both PMT and RMT. Understanding the variation reduces the risk for asking the wrong questions and thereby occupying the organization with taking wrong or unnecessary actions, creating investigations of random variation that have no single explanation. Particularly does the alternative report facilitate the joint team mind-set to shift from reactive explanations of the past behavior to more proactive and predictive future oriented, preparing for what is coming. This paves the way for increased productivity and reduced cost. Individuals in both PMT and RMT talks in terms of variation and stability in the beginning but it is not until after the team jointly has seen the same control charts in the workshop the discussion is elevated towards predictability.

The PMT had recently changed their way of doing KPI reviews. They had experienced an improvement lately therefore the desire of changes could be lower than in the RMT. That could be one explanation to the differences in attitudes towards the alternative report. This is also probably related to the not complete implementation of control charts from before, in which terms of variation was used but there exists a split understanding due to the fact that the necessary cornerstone train-the-team-as-a-team has eroded. This is probably natural in a system where this cornerstone is not defined explicitly. It is easy to assume that everyone fills the concepts with the same meaning and hard to recognize drifting definitions when time flows and people are replaced in the team (see the first comment in last row of column 1 in Table 1). The main advantages and disadvantages of the alternative report are summarized in Table 2.

Table 2 - Advantages and disadvantages of the alternative report

Advantages	Disadvantages
• Both mean and variation are displayed, providing more information about the process that facilitate an elevated joint understanding of process behavior	• Requires explanation of control limits • Necessary to prepare the data in e.g. a statistical software

• Estimated future result between the control limits, supplying predictability • Guidance of suitable actions depending on if the process is stable or unstable	• Requires awareness of drifting definitions and preventive maintenance of the cornerstone train-the-team-as-a-team

The workshops included the steps data feedback, data analysis and action planning in the action research model visualized in Figure 1. The next step is implementation. In both PMT and RMT implementation of the alternative report in the monthly review is planned as a result of the workshops. That indicates that the interactive workshops including alternative reports of KPIs enable the use of control charts on operational measures, which is adding important knowledge to science.

Important issues to consider being able to make this transformation is quality of data, to understand the concept of variation and to train a team as a team. When creating control charts the quality of data becomes evident. During the workshops discussions about KPI definitions and resolution occurred. The participants needed basic understanding of variation and common denominations of e.g. stability to be able to analyze the control chart. This common nomenclature was created when they were trained together as a team.

Conclusions and future research

In the alternative report the visualization of performance measurements are changed from only showing if the target is met (red and green figures) at single occasions into displaying variation by using control charts over time. Several advantages with the alternative report were identified e.g. predictability and guidance to suitable actions. The interactive workshops conducted enable the use of control charts on operational measures by creating a common understanding of variation with shared nomenclature by training the team as a team.

The next steps, implementation and evaluation of the alternative report at the PMT and RMT, will be further studied in the research project SureBPMS. The possibilities by using control charts in the KPI target setting process at different organizational levels will also be further studied.

Acknowledgement

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