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Whitepaper of Invensys
Real Time Operational Excellence Continuous Improvement Using Theory of Constraints

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Summary

Real Time Operational Excellence provides a fairly simple top-down analysis and bottom-up implementation approach which makes it fairly easy for organizations to engage and execute. It also is executed as a series of four phases, with the first three phases done as a sequence and the fourth as a Continuous Improvement process based on Theory of Constraints analysis. This combination results in unsurpassed levels of performance and sustainability of results.

Invensys has developed a structured approach that enables industrial companies to drive, sustain and continually improve the operational excellence of their industrial operations. There are three basic component parts to this real time operational excellence approach: 1) measuring the business in real-time; 2) empowering the operations personnel so they can make better decisions; and 3) implementing a continuous improvement process to drives the business measures of the operation (figure 1).

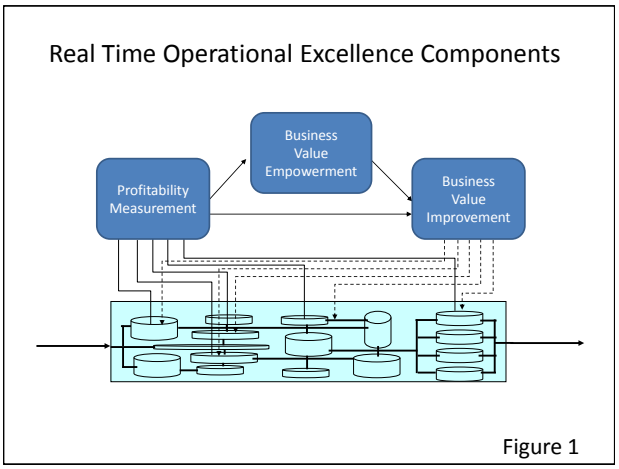

Figure 1
Real Time Operational Excellence Components

Implementing Real-Time Operational Excellence involves a four phase process (figure 2). The first phase is the development of the real-time performance measures of the operation. These real-time performance measures are identified by conducting a top-down set of decomposition analyses in four areas: strategy, technology, accounting, and human resources. The resulting performance measures are both financially based (real time accounting) and operationally based (real time key performance indicators). The strategy decomposition leads to a prioritization of both the financial and operational performance measures for each node in the operation. These combined and prioritized performance measures are commonly referred to as Dynamic Performance Measures (DPM). When the DPMs are identified right down to the base unit or area level of the operation, models of the DPMs for each unit and/or area are developed using process sensor data and business data as the source inputs to the models. The models are then developed into the automation system, typically at the control processor level of the system, and historized into the process historian on site. The DPM models are then executed in the automation system for a specified period of time to establish a performance baseline for the operation. This completes the first phase of the Real-Time Operational Excellence process.

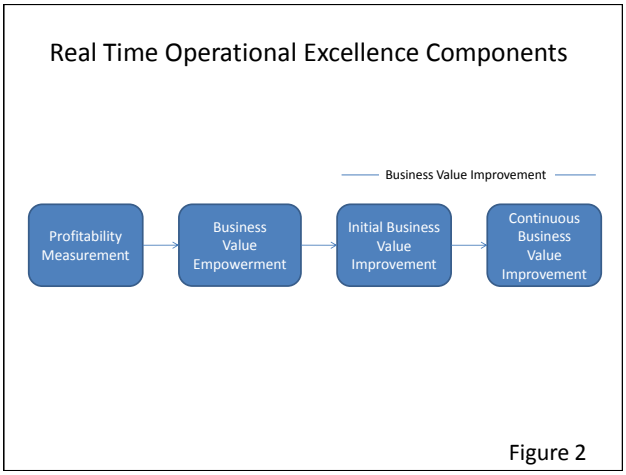

Figure 2
Real Time Operational Excellence Components

Once the baselines have been established the Business Value Empowerment phase of the Real-Time Operational Excellence process can be executed. Business Value Empowerment is implemented bottom-up, from the frontlines of the operations up through management. The Business Value Empowerment involves providing real-time performance feedback to every person in the operations whose actions impact the profitability of the operation. The most common form of feedback is a simple dashboard display such as the one in figure 3.

The basis of the Business Value Empowerment is that the personnel perform their activities as they traditionally have, but with each action they take the feedback will enable them to discern whether they added or detracted value from the operation. In this manner they tend to learn over time how to perform their duties in a value-adding manner. If all operational personnel start performing their duties in a value-improving manner, the performance of the operation tends to improve significantly. Over time the business performance of the operation tends to improve fairly significantly through the Business Value Empowerment. At some point the performance tends to level off as the personnel tend to maximize their impact through empowerment.

Figure 3
Typical Multilevel Real-Time Performance Dashboards

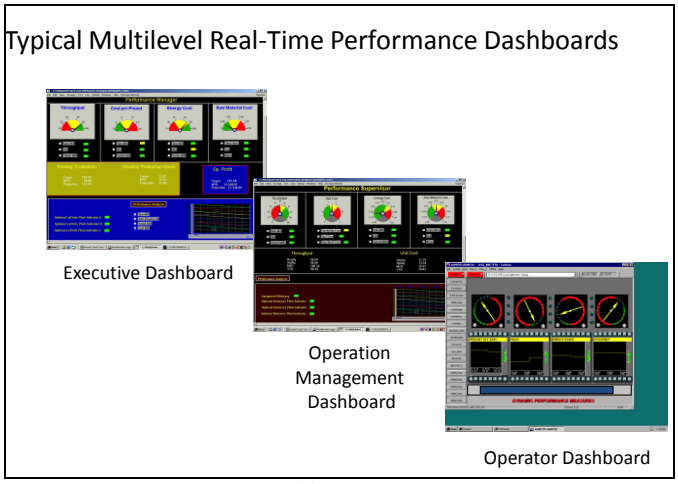

Figure 3

The third phase of the Real-Time Operational Excellence process is the Initial Business Value Improvement phase. Experience has demonstrated that in the process of executing the four decomposition analyses many performance improving opportunities are typically identified. The team conducting the decompositions should note these opportunities as “low hanging fruit” that can be initially executed to gain additional performance improvements. When each of the identified improvement activities is executed the incremental value becomes measurable and visible through the installed DPMs and empowerment portals.

Once the initial improvements are completed and the incremental value from each improvement is determined, the organization can them move to the fourth phase of the Real-Time Operational Excellence process – the continuous improvement phase. Once again, this phase is driven by the installed DPMs which convey the business value being generated within the operation. As the Real Time Empowerment and each improvement are implemented the results should be discernible by monitoring the DPMs. Since the DPMs monitor the value of the operation and of each improvement, monitoring the DPMs make it very clear when a constraint on that DPM has been encountered. At a constraint point the value of the DPM tends to stop improving and to level off. This leveling of the DPM indicates that some constraint has been encountered. It gives no indication of what the constraint is. It may be a human imposed constraint, a process constraint, a safety constraint, an equipment constraint, or an environmental constraint. At this point a Continuous Improvement (CI) team can be assigned to analyze the constraint and determine what it might take to alleviate the constraint enabling additional improvement of the performance of the operation. Since there are typically a number of DPMs across an industrial operation, there is typically an ongoing need for improvement. Each leveling of the value of a DPM is an indication of encountering a constraint point. In a sense the process involves the combination of CI methodologies and Theory of Constraints analysis as introduced and defined by Eliyahu M. Goldratt in his book “Theory of Constraints.” This is why this phase of the Real-Time Operational Excellence process is sometimes referred to as Theory of Constraints Based Continuous Improvement.

One nice characteristic of this approach to continuous performance improvement is that the DPMs are already in place and established prior to the initiation of the CI process. Experience with traditional CI has shown that the development of the performance measures by the CI Teams is typically the most time and effort intensive aspect of team problem solving. Since the measures are already established, the CI activities progress at a faster pace than traditionally expected.

A second positive characteristic of this CI approach is that the DPMs are specifically tied to critical business drivers and, in many cases, directly to profitability. This means that the business value of the activities of each CI team is clearly measurable in business terms. Some organizations have found it to be difficult to value their CI programs. That issue is resolved with this process.

Finally, one of the largest shortfalls of many CI programs is that the performance tends to reduce back to its initial levels with time. That is, the performance is not sustainable. One of the key probable causes of this is that the teams move on to new problems and new constraints and those that have been previously addressed tend to become invisible. This lack of visibility is a huge sustainability problem. With the Real-Time Operational Excellence CI process the DPMs are continually visible due to the Business Value Empowerment. Visibility leads to sustainability. Therefore this approach provides sustainable continuous performance improvement.

About the author

Dr. Peter G. Martin has been a member of the MC&A Hall of Fame since 2018. He is VP of Innovation and Marketing and an Edison Master at Schneider Electric. He has worked in industrial automation for over 40 years in training, engineering, product planning, marketing, and strategic planning. Peter holds multiple patents for dynamic performance measures; real-time activity-based costing; closed-loop business control; and asset and resource modeling. He is a published author, was named one of Fortune magazine's "Hero of U.S. Manufacturing" and one of InTech magazine's 50 most influential innovators of all time in instrumentation and controls. He is an ISA Life Achievement Award recipient, an ISA Fellow, member of the Process Automation Hall of Fame, recognized for his work in integrating financial and production measures that improve the profitability and performance of industrial process plants. Peter has a bachelor's and a master's degree in mathematics, a master's degree in administration and management, a Master of Biblical Studies degree, a doctorate in industrial engineering, and doctorates in biblical studies.