



Manufacturing quality assurance with IBM Cognos Now!

Mitigate quality risk with
operational performance
management

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Abstract

This white paper reviews recent changes in the practice and implementation of manufacturing quality assurance, and the resulting impact on companies. It explains the technological problems faced by organizations that must monitor manufacturing performance, and describes the many advantages of “operational performance management” as enabled by IBM Cognos® Now!.

Overview

Every product you create is a reflection of your company and brand. The impact of poor quality can have huge ramifications on your company’s customer satisfaction, profitability, and brand equity.

But superior quality does not just happen. Quality management is a business imperative that demands continuous, diligent monitoring of all critical processes throughout the entire manufacturing cycle.

The impact of current trends in quality assurance – and in the marketplace at large – is significant, as are the ways these trends have altered the landscape of manufacturing. IBM Cognos Now! resolves the disparate demands of manufacturing quality assurance by providing an integrated view of quality management that enables businesses to adapt in an ever-changing marketplace.

Business problems

In recent years, two major trends have made manufacturing quality assurance more challenging.

The first is that many manufacturers have instituted a build-to-order (BTO) strategy whereby products are built upon receipt of orders without forecast, inventory, or purchasing delays.

The second is the increasing practice of collaborative design, development, and distribution among manufacturers, particularly in the automotive, pharmaceutical, electronics, and high-technology sectors.

As a result of these trends, businesses must now collect and analyze large amounts of data from many disparate sources to closely monitor the quality of the manufacturing process. Manufacturers need timely information that enables them to make critical decisions and take corrective action in real time when potential quality issues are discovered. Sound difficult to accomplish? That was before IBM Cognos Now!

Business drivers

Managing product quality in a collaborative world

Not too long ago, the goals for manufacturing were simple and straightforward: optimize costs, produce high-quality products, and use assets effectively.

Vertical integration was a key organizing principle. But as the competitive global environment has evolved, so, too, has the role of manufacturing. A variety of drivers have contributed to the changes in manufacturing, including increased competitive pressures, more demanding customers, downsizing, the globalization of customers and suppliers, shorter product life cycles, and shorter time-to-market. As a result, many companies have employed a strategy of collaborating with different business partners in the design, development, and distribution of their products.

Although collaborative manufacturing offers distinct cost and time-to-market advantages, it poses several challenges to product quality.

First, collaboration itself introduces some inherent quality risk. Collaboration takes place at interfaces between components and subsystems, as well as between people across multiple business partners. Any communication error between the interfaces or people may result in process deviations that compromise final product quality.

Second, companies no longer rely on suppliers just for raw materials and base components; but they also rely on the supply base for much of the production. For example, in the personal computer industry, several leading manufacturers rely on their suppliers for as much as 80 percent of the product's bill of materials cost. As a result, final product quality depends highly on the quality standards of each supplier.

A build-to-order (BTO) strategy in a collaborative manufacturing environment also exacerbates quality risk by placing more design variables into the process. Because they allow different combinations of product options based on customer demand, BTO systems may result in different and potentially unpredictable interactions among the options. Another contributing risk factor is the low variety of individual parts and raw materials in BTO operations. To efficiently implement a BTO process, companies must drastically reduce the variety of parts and raw materials to the point where these materials can be procured spontaneously by automatic and pull-based techniques. But a reduction in parts also means that the quality of each part is integral to the overall quality of the finished product.

Key requirements for a manufacturing quality assurance system

Monitoring manufacturing quality poses some unique technological challenges and requirements that must be fully met before you can effectively mitigate quality risk. The single biggest obstacle to deploying a manufacturing quality assurance solution is data: availability, quality, and access. Several factors make it difficult to ensure quality manufacturing:

- Data and events come from many disparate sources, including those of your suppliers, contract manufacturers, and other business partners.
- Data types and formats vary from one source to the next. Business partners in the collaborative supply chain may use different data schemas and systems to track their manufacturing process.
- Large volumes of events and data must be processed from each interface and subsystem used in the manufacturing process.
- Events are often asynchronous and must be synchronized according to time of occurrence. This capability is critical in a manufacturing environment where multiple manufacturing processes occur independently of one another.
- As new suppliers and business partners are added, the solution must be able to accommodate new and changing data types, data models, and business rules.

The solution

Given these challenges, the ideal quality assurance solution must have the following characteristics:

- **Continuous.** Critical alerts and reporting of quality metrics must be delivered in real time to enable intelligent decision-making and action.
- **Complete.** A solution must leverage all available sources of data throughout the entire manufacturing process to deliver a holistic view of quality management.
- **Understanding.** Smart decisions must be based on data that accurately reflects the true state of the entire manufacturing process.
- **Optimized.** A solution must leverage existing infrastructure investments without requiring additional data consolidation or integration projects.
- **Flexible.** The quality assurance solution must be able to adapt to different data models, data sources, or changes in the underlying sources. New business rules can be dynamically defined and modified in an iterative fashion to deal with evolving quality and compliance requirements.

IBM Cognos Now!

IBM Cognos Now! offers a new and fundamentally different approach to monitoring manufacturing quality through operational business intelligence. This new approach is called operational performance management. IBM Cognos Now! is the first and only solution on the market designed from the ground up to harness the power of event driven architectures for improving operational efficiency and increasing profitability in the enterprise.

IBM Cognos Now! monitors material business events that provide visibility into production quality from ERP, SCM, PLM, quality test systems, supplier/contract manufacturer extranets, and other manufacturing subsystems. It captures individual business events and then relates it to historical information in data warehouses or applications. When exception conditions are detected against predefined quality metrics and business rules, IBM Cognos Now! generates alerts instantaneously. The result is that critical alerts are produced in real time along with updated key operational metrics providing the necessary understanding to take intelligent action. Additionally, it enables quality and production managers to create sophisticated rules for tracking deviations in product quality without requiring technical assistance from the IT team.

Dynamic architecture

The core features of IBM Cognos Now! include

Streaming DataFlow Engine

The IBM Cognos Now! Streaming DataFlow Engine monitors business events and integrates those events with contextual data from data warehouses or operational systems in real-time. The engine employs an event-driven approach that, unlike traditional batch-driven solutions, pushes key metrics and alerts to business users as events happen, minimizing the latency between events and action. Moreover, the DataFlow Engine can process data gathered from various operations or data sources to provide a complete, higher-value view of critical quality metrics.

Adaptive intelligence

IBM Cognos Now! provides a flexible dynamic modeling system that enables business users to quickly adapt data models and apply them to live data as it is being streamed into the system.

Temporal processing

The IBM Cognos Now! capabilities enable you to associate time with events, allowing you to identify trends over time and understand events within the larger business context. Temporal processing also enables the system to distinguish between momentary spikes and real trends. This eliminates false positives and ensures that alerts are sent only when notification and action are truly required.

Operational dashboards

IBM Cognos Now! includes operational dashboards that provide real-time visibility into business operations and key risk indicators, allowing users to quickly react to changing market conditions and make timely decisions. Operational dashboards can be used to acknowledge alerts generated by the activity server or to initiate actions such as generating workflows, for example, based on alerts. Each user can personalize his dashboard with the metrics and alerts that are relevant to his job function.

Rich, robust analytics

In addition to receiving alerts concerning business events, IBM Cognos Now! provides detailed metrics and contextual data that help you process and act on the alerts.

Seamless integration

The IBM Cognos 8 platform easily integrates with operational applications and legacy systems that already exist in your environment via standard interfaces.

Manufacturing quality risk metrics

IBM Cognos Now! enables you to easily and quickly define and create business rules for tracking manufacturing quality risks. You can customize them according to the unique quality management standards of your organization. Following are examples of situations in your manufacturing environment you can track using custom business rules

- **Yield drops.** Alert when the yield has dropped in a particular quality test. Based on the duration of the yield drops, you can take the appropriate action. For example: For a 1-day drop in yield: notify the contract manufacturer of the issue. For a 3-day drop: notify the supply-base engineering and quality groups. For a 30-day drop: notify the product planning and quality groups.
- **Critical component failures.** Alert when a yield drop is accompanied by a high percentage of failures of a critical component.
- **MTBF and MTTF.** Alert when the mean-time between failures (MTBF) or mean-time to failure (MTTF) exceeds the accepted threshold.
- **Impacted products.** When a yield drop is accompanied by a critical component failure and the component is used to manufacture multiple products, the manufacturing process of the affected products may need to be temporarily suspended.
- **Yield drop caused by revision change.** Components are constantly being revved in terms of their revision numbers. Compare the yield of the older part revision with the newer revision to ensure that the two production lots are of the same quality.
- **Supplier qualification.** Create metrics that alert on critical performance measurements for a new supplier such as defect rate, on-time deliveries, price/performance, purchasing compliance, and others.
- **High customer return rate.** Alert when the percentage of Return Merchandise Authorizations (RMA) for a particular product lot exceeds a specified threshold.

- **Inventory turns.** Alert when the number of inventory turns for a product line drops below a specified threshold.
- **Cycle times.** Alert when the cycle time for a product line exceeds the specified time period.
- **Scrap and rework costs.** Alert when scrap and rework costs exceed a specified percentage of sales for a product line.
- **Customer lead time.** For a BTO operation, alert when the lead time for an order exceeds the time period promised to the customer.
- **Delivery times.** Alert when the deliveries of critical components, which are used to produce multiple products, have not been met.
- **ISO 9000.** Alert on various metrics to ensure compliance with ISO 9000 requirements.

Dynamic presentation and workflow

The IBM Cognos Now! Streaming DataFlow Engine provides the core capability to monitor real-time business transactions and compare them with historical patterns while updating those patterns as well. To compile a complete and accurate view of manufacturing quality risk, business events and data should be streamed into the DataFlow Engine. The system can process a wide variety of data types and formats from different sources including databases, data warehouses, ERP, SCM, PLM, and custom applications. As events are streamed into the system, the engine automatically and instantly delivers continuous updates of what is currently happening, giving you the most up-to-date view of critical manufacturing quality metrics and activities possible. Business users can access an intuitive self service dashboard and view inventory, production, quality, revenue and other key performance indicators as they happen.



IBM Cognos Now! can deliver alerts, metrics, and reports into any workflow or case-management environment. Email systems, RDBMS, Web services, middleware, and custom applications are all acceptable recipients of information from IBM Cognos solutions. Alerts can be timed and escalated based on user-defined intervals to maintain the highest levels of vigilance. Additionally, you can create custom workflow rules that automate the escalation of alerts to different users based on their roles and responsibilities for ensuring quality.

Dynamic modeling

Unique to IBM Cognos Now! is adaptive modeling, which allows you to create new metrics dynamically or set thresholds without disruptions or latency of information. The IBM Cognos Now! solution is uniquely designed to seamlessly support new data models, data types, data sources, and business rules. Conventional business intelligence solutions can take weeks, if not months, to accommodate changes to their data models. IBM Cognos Now! makes such changes easy without requiring changes to the underlying systems. Quality and production managers can use the operational dashboard interface to create new rules and quality metrics without having to wait for IT assistance.



The operational dashboard employs a spreadsheet-like interface that makes it easy to specify business rules and exception conditions and enables you to adapt those rules as conditions change over time. Conventional business intelligence solutions can take weeks, if not months, to accommodate changes to their data models and most do not support rules that business users can change on their own.

Conclusion

The IBM Cognos Now! advantage

As collaboration plays an increasingly important role within the manufacturing supply chain, companies are finding that managing product quality is more complex now that manufacturing activities are distributed across many entities. IBM Cognos Now! provides continuous business activity monitoring to help you meet the difficult challenges of monitoring and managing manufacturing quality assurance.

It includes a Streaming DataFlow Engine and temporal processing capabilities, delivering benefits to both business and technology executives as outlined below. Business benefits include your ability to

- Maintain high customer satisfaction and protect your reputation by ensuring that your products are developed with the highest quality.
- Avoid monetary losses resulting from providing poor quality products that result in costly penalties or refunds to customers, expensive rework, and lost sales to competitors.
- Improve efficiency and profitability. An enterprise wide view of quality risk should be incorporated into operational decision-making to improve efficiency and increase profitability.
- Provide greater transparency into the quality risks facing your manufacturing operations.
- Reduce cost by eliminating the prerequisite of consolidating and integrating data. IBM Cognos Now! provides a complete solution – you do not need to manage a separate ETL tool, rules engine, and alerting tool, nor do you need to integrate them.

Technology benefits include:

Enhanced manageability

The tools and SQL compliance inherent in IBM Cognos Now! help you leverage your existing IT skill set and provide comprehensive graphical tools to manage events, context, rules, and alerts.

Flexibility and adaptability

Respond to changing quality requirements as they occur. The Adaptive Intelligence feature dynamically and automatically adapts to changes in data models or business rules based on new suppliers, regulations, or quality metrics to ensure that you are always meeting the specified quality standards.

Seamless access to more data sources

Using the DataFlow Engine capability, you can implement true real-time alerting quickly and deploy new monitoring capabilities without having to modify your existing infrastructure.

Increased maintainability

A virtual, in-memory database eliminates the need for you to maintain an additional database or data warehouse. IBM Cognos Now! leverages your existing data warehouse/ODS as a context source to simplify the database maintenance requirements of your solution, while reducing cost and time to market.

New demands in the marketplace necessitate new ways of monitoring manufacturing quality. IBM Cognos Now! provides a means of unifying data through operational performance management in order to better serve the needs of organizations, quickly and efficiently alerting employees to risks and events while seamlessly integrating into existing environments.



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About IBM Cognos BI and Performance Management

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