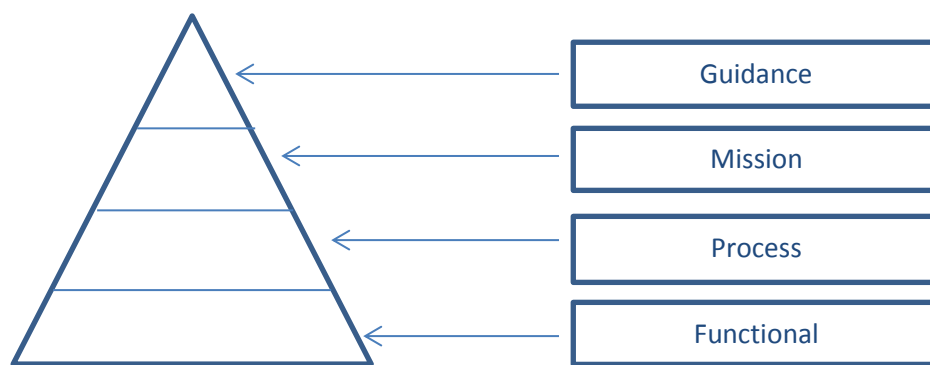


## Business Intelligence and Operational Metrics

Operational Metrics are used to provide results based information to leaders to make informed critical decisions, based on data available from a plant or machine. These metrics are provided at four different levels of the so called 'Value Pyramid'.

Starting from the bottom and moving upwards, the four levels of the pyramid are : Functional, Process and Procedure , Mission and Objective (Operational-Mission and Tactical), and finally Guidance and Metrics ( Strategic Organization) at the top of the pyramid.



To measure any type of metrics, one needs to

1. Identify the performance criteria, indicators, descriptors and candidate measures required to impact the end - to - end interoperability.
2. Identify a governance process to capture and integrate critical information related to performance and metrics.

Manufacturing Planning encompasses the hourly / daily / weekly / monthly production and machine schedules across multiple plants or production lines to meet orders or forecasted demand. Success hinges on accurate materials planning. Manufacturing managers, product managers and purchasing analysts review metrics such as production capacity and current inventories to plan appropriate production schedules, ensure raw material availability and make plant reallocation decisions when appropriate.

Basic analysis includes real-time status of plant utilization and trends in market demand versus planned production runs. Advanced analysis includes hedging analysis on commodities used in production, forecasting of machine output and linear programming to optimize production resources.

Data spanning across multiple systems, and data compared across a wide range of subsets, like

- Date/Time
- Shift/Crew/Employee
- Supervisor
- Product (Category/Sub-category)
- Lot/Batch
- Quality code
- Customer
- Machine/Class
- Area/Plant

can be analysed across multiple dimensions via techniques like Slicing, Dicing, Roll Up, Drill Down and Pivoting techniques.

The following are the various operational metrics that can be created from the verification and inspection data collected.

- Back Log
- Capacity Utilization
- System Uptime
- Failure Cost Value
- QC Reject Rate

Computed values can be used to perform more advanced analyses :

- Average/Range
- Ranking (top 10 worst quality)
- Standard Deviation
- Tolerance variance

All the above can be created using tools, depending upon the size of the data, that range from Simple Relational Databases to complex analytical tools like Hadoop.

### **Case Study**

Machine Vision applications form an important part of the Quality Control / Quality Assurance process in a wide range of industries. Therefore, these applications very often need to be integrated along with operational metrics such as defect / rejection rates. In this example, a machine vision application was developed to perform over 50 inspection checks, using two different high resolution cameras, on a wrist watch assembly line. The application was integrated with collection of inspection results in a relational data base. Separate standalone applications were developed to report the inspection results, giving details of each type of defect found, over hourly, shift-wise and day-wise time frames. The following screen shots show the vision application with an accepted part, and the report generator with a daily report.

Form1


dial

About Configuration Run Continuously  
Live Image Save VPP Run Once

Current user: Administrator I/O enabled

**dial: ACCEPTED**

LastRun: Image Source: OutputImage



Overall Results Individual Test Results General CPD Pinion Minute wheel Dial

- A. CPD wheel presence / color test True
- B. CPD wheel teeth test True
- C. CPD wheel punchout test True
- D. CPD center bridge test True
- E. Pinion teeth test True
- F+G. Pinion center test True
- H. Minute wheel presence / teeth test True
- J. Minute wheel Boss test True
- V. MW Pinion teeth Test True
- K. Minute wheel surface test True
- L. CSSL test True
- M. Minute wheel place test True

ARCEE AUTOMATIONS Machine Vision and Robotics Lab www.abacusmc.com

PLANT AUTOMATION \* ROBOTIC SOLUTIONS \* MACHINE VISION \* CUSTOM CONTROLS

Start Release Form1 6:06 PM

Titan Bridge Daily Report V1.3

Startdate: 01/01/2008 Enddate: 24/06/2009 daywise reject report

Daywise Reject Report for the period from 01/01/2008 to 24/06/2009

Date and Time	Total Inspected	Total Accepted	Total Rejected	Pivot2	Pivot1	Pivot3	Jewel	Mwboss
Friday, November 14, 2008	1	0	1	0	0	0	0	0
Saturday, May 16, 2009	1571	1402	169	3	21	1	17	0
Sunday, May 17, 2009	1	1	0	0	0	0	0	0
<b>Report Total-&gt;</b>	<b>1573</b>	<b>1403</b>	<b>170</b>	<b>3</b>	<b>21</b>	<b>1</b>	<b>17</b>	<b>0</b>

Hourly Report

start VisionPro(R) QuickBul... Titan Bridge Daily Re... 17:40