Breaking the Wall – Performance Measuring of a Production Line Composed of Two Business Entities

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ABSTRACT

“One can improve only what one can measure” this embracing statement by Mathur, Dangayach, & Sharma (Performance measurement in automated manufacturing, 2011, p. 77) is at the core purpose of any measurement done. Having a defined metric enables the capability to distinguish if something is changing and if so in what direction. Measuring the performance of a business organization stands at the heart of several core issues such as: strategic alignment of objectives, ownership of business goals, and determining process capabilities. As the business world is moving to higher levels of partnerships and processes tend to include more than one business entities performance measuring is stretching to include parts of the business such as suppliers into the process. This paper reviews the performance measurement system (PMS) applied on a manufacturing line structured from two business entities, supplier and customer, which are being addressed as one manufacturing line. The paper starts with a general review of performance measurement systems background in terms of purpose and concepts. The current PMS “tool box” of the joint manufacturing line is explored, detailing the metrics used with their impact on the process – benefits and short comings. Based on the analysis of the current PMS several recommendations are made for improving the organization’s performance.
Outline

Performance measuring systems (PMS) & supply chains

Supply chain as an integrative management system (IMS)

hp Indigo supplier-customer interface

Case study – hp Indigo strategic supplier
“One can only improve what one can measure”

Mathur, Alok,
Malaviya National Institute of Technology, Jaipur, India, 2011
Performance Measuring Systems (PMS) & Supply Chains

**PMS Goal** - Measuring the performance of a business organization stands at the heart of several core issues such as: strategic alignment of objectives, ownership of business goals, and determining process capabilities.

**PMS in supply chains** - Unlike the classic approach portraying the supply chain in terms of purchasing raw materials and measuring the performance by their cost and by the service responsiveness of the suppliers. Suppliers are being incorporated into the business as partners, moving away from the traditional way of measuring only through accounting.

<table>
<thead>
<tr>
<th>Period</th>
<th>Business characteristics</th>
<th>PMS characteristics</th>
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| Before 1980 | Systematic large organizations | • Cost/accounting.  
• Retroactive approach  
• PMS by profit measuring |
| 1980-1990 | Global businesses              | • Cost/accounting  
• Retroactive approach  
• PMS enhanced to include operations aspects |
| 1990-2000 | Automated process businesses   | • Mixed financial & operational orientation  
• Mixed proactive & proactive approach  
• Result oriented organizations  
• PMS enhanced to include customer, process, & quality focus |
| 2000-2010 | E-commerce businesses          | • Balanced integrated orientation  
• Proactive approach  
• Engage organizational responsiveness  
• PMS enhanced to include supply chain & inter-process activities |
**Integrative Management System (IMS) Approach**

**IMS approach** - The holistic view of management systems call for an integrative approach as described in the work of Stanislav Karapetrovic*. The approach looks on the broader view of the operation taking into account all of the stakeholders around it.

“It is measures, metrics, and indicators that give life to the quality vision by providing it with measurable expectations”

Kwee Keong Choong

University of Macau, Taipa, Macau SAR, China
hp Indigo Approach to Supply Chain Management

Interface Build-up
hp Indigo Supply Chain - Case Study

Business Context

hp Indigo division produces hp’s digital presses for commercial & industrial printing shops. The division sells printing presses as well as consumables for these presses where the main 3 items are ink, PIP (photo imaging plate), and printing blankets.

A printing blanket is the component used to carry the image from the imaging plate onto the printed media. In the hp Indigo digital printing presses the blanket is a complex multilayer material based on semi-conducting & semi-porous rubber layers.

High business volume both in terms of material/units produced & overall cash flow. Close to 90% of the actual production is done by strategic suppliers.

The main quality and business indicator used to overview this operation is production yield and since 80% of the product is the blanket body a main metric is the body yield.
hp Indigo Supply Chain - Case Study

Interface Build-up – Results

- 40% cost reduction
- 60% capacity increase
- 10% yield increase
hp Indigo Supply Chain - Case Study
Mature Interface – Yield Breakdown

Monthly Yield Trend
(Sep-12 to Jan-15 hp)
## hp Indigo Supply Chain - Case Study

### Mature Interface – Main Elements

<table>
<thead>
<tr>
<th>PMS Main Elements Matrix</th>
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<tbody>
<tr>
<td><strong>Process control</strong></td>
</tr>
<tr>
<td>Defined critical to quality measured against clear and aligned targets</td>
</tr>
<tr>
<td><strong>Yield management</strong></td>
</tr>
<tr>
<td>Clearly defined against the business targets thus driving for continues improvement</td>
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Quality Events Root Cause Analysis
5y's Methodology

- Eruption of a quality event
  - Process failure
  - Ling line – high WIP
  - Why?

- Weak point in the process
  - No improvement to the weak process point
  - Why?

- Rigid change management policy
  - Why?
### Proposed Action Plan

<table>
<thead>
<tr>
<th>PMS element</th>
<th>Phase 1 (Timeframe – 2 weeks)</th>
<th>Phase 2 (Timeframe – 1 month)</th>
<th>Phase 3 (Timeframe – 3 months)</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change management</strong></td>
<td><strong>Motivation</strong> 1. Analyze former changes 2. Identify direct loss of delays 3. Establish link to quality events</td>
<td><strong>Analysis</strong> 1. Analyze change process 2. Identify “hard to pass” steps 3. Identify redundancies</td>
<td><strong>Improve</strong> 1. Identify management promoter 2. Define short cycle qualification based on detailed risk analysis</td>
<td><strong>Top management</strong> Alignment with change drive and risk taking</td>
</tr>
<tr>
<td><strong>Quality events</strong></td>
<td><strong>Motivation</strong> 1. Summarize yearly scrap generated by quality events 2. Identify indirect losses due to quality events</td>
<td><strong>Analysis</strong> 1. Identify trends and repeating events 2. Process FMEA – identify weak process points</td>
<td><strong>Improve</strong> 1. Set preventive actions based on PFMEA. 2. Set control mechanism – suggestion FMEA format auditing</td>
<td><strong>Technical team</strong> Analyze process data Define new processes and procedures <strong>Quality expert</strong> Customize tools and indicators to fit process</td>
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