

BAE Systems (Rochester) – supplier development programme



Introduction

- Lee Penford – Head of Procurement
- Simon Jaros – Senior Manufacturing Engineer

The Rochester business

- Part of the Platform Solutions business sector within BAE SYSTEMS
- Engineering and manufacturing site with a mix of technology demonstrator, product development and manufacturing programmes.
 - Producing wide range flight safety and mission critical products
- World leader in,
 - Aircraft flight controls: active inceptor systems, fly by wire flight controls & flight control computing.
 - Displays: head up, head down & helmet mounted
- Platforms:
 - Military (fixed wing), Eurofighter (Typhoon), C17, F22, Gripen, Joint strike fighter,
 - Military (Rotary wing), UH-60 (Black Hawk), CH-53 (Sea Stallion), Eurocopter Tiger
 - Commercial aircraft: Boeing, Airbus, Embraer.

Supplier development journey

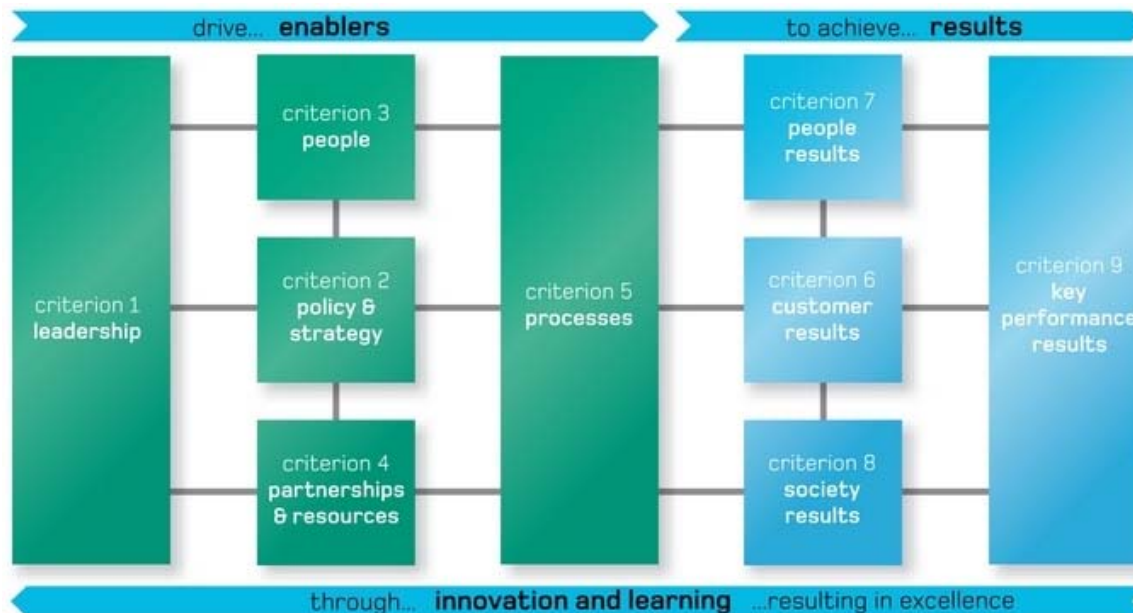
- Pre 2006 traditional Supplier quality approach
 - Audit and action
- Poor performance on a major manufacturing program led to the supplier development initiative.
 - Identified the need for a different approach with three problem suppliers
 - Self funded risk mitigation activity on the subsequent program phase
- The approach was continuous improvement not audit focused
 - Established a team of three manufacturing process engineers embedded in procurement
 - Site Directors provided senior level sponsorship and support
 - The team's focus was long term, sustainable quality and delivery benefits through manufacturing process improvements at the suppliers facility

Supplier development journey

- Initial six month period
 - Degree of reluctance and suspicion from suppliers
 - As benefits became apparent the approach became more collaborative to the point where the suppliers started to pull on our expertise.
- Six to twenty four months
 - Process improvements were embedded and quality and on-time delivery improvements started to be seen
 - Secondary benefit was the growth in our product technical knowledge to assist and enhance our sub-contract management capability
- Twelve to eighteen months
 - Started to roll out across other programs and suppliers

The supplier development programme

- The development programme has been developed from established lean manufacturing principles and continuous improvement models
 - The lean manufacturing principles used were initially developed within the automotive industry.
 - The European foundation of quality management (EFQM) continuous improvement model is used to provide an improvement framework



The supplier development programme

As an initial approach the supplier development team work with the supplier to agree Performance metrics.

- The two measures of performance used within our development programme are:

$$\text{Quality} = \frac{\text{Number of rejects}}{\text{Number of deliveries}} \quad (\text{Expressed as \%})$$

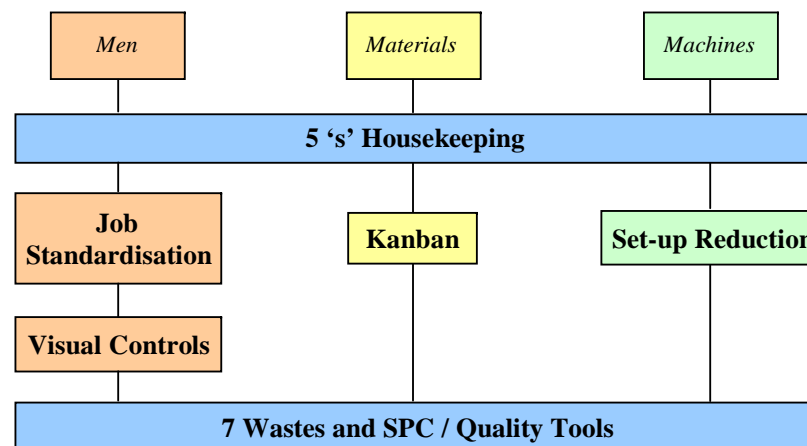
$$\text{Ontime Delivery} = \frac{\text{Number of 'Ontime' deliveries}}{\text{Number of scheduled deliveries}} \quad (\text{Expressed as \%})$$

The supplier development programme

After agreeing performance metrics the supplier development team work with the supplier to evaluate their process controls and establish a level of lean maturity

- This is achieved by conducting a joint assessment
- The assessment is then used to highlight development activities

A framework for Manufacturing Excellence



*..... supported by design related improve
methodologies (VE/VA or QFD).*

Development toolset

The initial assessment is conducted against defined scoring criteria in the areas below.

<p>Visual Control Improvement Activities Board</p> <ul style="list-style-type: none"> ■ Topical activity board. Frequent review process. SMART objectives. Appropriate targets displayed. ■ No cell/dept activity board in use. 	<p>Visual Control Skills matrices</p> <ul style="list-style-type: none"> ■ Employees trained in three or more competencies. Skills matrix displayed. Supported by training programme. Competencies actively used. ■ Employees trained to a recognised standard in one competence. 	<p>Visual Control Production Control Board</p> <ul style="list-style-type: none"> ■ Planned v actual production plan displayed. Appropriate planning period used e.g. hourly, daily, etc. Variances and corrective actions used. ■ No visual indication of production plan. 	<p>Visual Control Quality/Defects</p> <ul style="list-style-type: none"> ■ Target and actual quality levels are displayed and topical. Cost of quality displayed. Analysis and corrective actions displayed and topical ■ No monitoring of Cost of Quality and / or scrap levels. 	<p>Visual Control Inventory</p> <ul style="list-style-type: none"> ■ Cell/dept. target and actual displayed. Targets from Business Plan. Team understanding. Clear & concise controls. Subject to review. ■ Excess inventory observed.
<p>Visual Control Man-hour Reduction</p> <ul style="list-style-type: none"> ■ Cell/department topical plan displayed. Target v actual shown. Ownership of plan is clear. SMART objectives. Subject to review. ■ No man hour reduction plan. 	<p>7 Wastes Processing</p> <ul style="list-style-type: none"> ■ Correct use of feeds and speeds, number of cuts, etc. Close to Form material used as appropriate. Suitable method of manufacture. Standard job in use. ■ Processing waste observed e.g air cutting, oversize material, excessive dwell time, etc. 	<p>7 Wastes Movement</p> <ul style="list-style-type: none"> ■ Employees working effectively. Best practice workplace ergonomics. Minimum movement "off/for/around" the job. Rules of movement economy understood & in use. ■ Excessive time spent looking for tools, collecting materials, etc. 	<p>7 Wastes Waiting Time</p> <ul style="list-style-type: none"> ■ Minimum waiting time observed e.g. waiting for NC equipment to stop, waiting for materials, etc. Multi-equipment manning. Use of 'Andon'. ■ Waiting time frequently observed. 	<p>7 Wastes Overproduction</p> <ul style="list-style-type: none"> ■ Component quantities in accordance with customer requirements. Planned inventory. Customer/Supplier interface. ■ Product manufactured to cover for scrap, anticipated demand, etc.
<p>7 Wastes Quality/Defects</p> <ul style="list-style-type: none"> ■ Prevention based detection employed on key processes e.g. in-process checks, probing cycles. Operator self inspection employed for all jobs. ■ Downstream capture of quality issues e.g. final inspection. 	<p>7 Wastes Inventory</p> <ul style="list-style-type: none"> ■ Components manufactured in appropriate batch sizes - ABC categorisation. Minimum/planned inventory. Minimum batch sizes from Suppliers. ■ Large/variable batch sizes. No supporting methodology. 	<p>7 Wastes Transportation</p> <ul style="list-style-type: none"> ■ Minimum distance required to transport product, tooling, materials, etc. Appropriate transportation media used. Appropriate close coupling. ■ Excessive movement and handling required. 	<p>5S Workplace Organisation Environment</p> <ul style="list-style-type: none"> ■ Show room type environment. Pathways and areas clearly marked. First line operator maintenance. ■ Untidy - room for improvement. 	<p>5S Workplace Organisation Address and Place</p> <ul style="list-style-type: none"> ■ Materials, parts, tools, etc, clearly marked and held in appropriate locations. Good workplace ergonomics and storage media. ■ Locations not obvious. Cluttered storage.
<p>Set-Up Reduction</p> <ul style="list-style-type: none"> ■ Key processes/bottlenecks targeted for SUR activity. Target and actual displayed. Good workplace ergonomics. ■ No/anecdotal evidence of SUR activity. 	<p>Standardised Job</p> <ul style="list-style-type: none"> ■ Method and time documented at appropriate level of detail. Standard job adhered to. (Insignificant deviation in method/time) Job subject to frequent review. ■ Significant variations from standard job No review cycle. Insufficient detail 	<p>7 Quality Tools</p> <ul style="list-style-type: none"> ■ 3 or more tools in active use. Information used to enable improvements. Team trained in all Tools. Evidence of improvements. ■ No/anecdotal evidence of the Quality Tools. 	<p>7 Quality Tools Process Control</p> <ul style="list-style-type: none"> ■ Valid application procedures exist problem solving techniques used, CPK of 1.66 being achieved, Management/operators trained, action taken on Out of control conditions. ■ No use of SPC within the cell. 	<p>Kanban</p> <ul style="list-style-type: none"> ■ Supply and demand synchronised. Mechanism applied to all suitable areas. Lower tier supplier involvement. Non-product applications. ■ Kanban mechanisms not in use.

Assessment example

Within the toolset scoring criteria are clearly defined

Visual Control Improvement Activities Board	
How the organisation ensures visibility of improvement initiatives.	
Expectations	
4.	<p>Topical activity board, displaying what improvement activities are actually taking place. Activities are time bound with responsibilities indicated. Frequent review process in place to ensure topicality (daily, weekly meetings centred around the improvement board). Targets are shown where appropriate, e.g.. quality, delivery with SMART objectives.</p>
3.	<p>Topical activity board, displaying what improvement activities are actually taking place. Activities are time bound with responsibilities indicated. Team understanding. Targets are not shown.</p>
2.	<p>Improvement plans / activities displayed but lack sufficient detail to effectively progress issues. Team understanding. Board is not topical.</p>
1.	Information displayed is of a general nature, e.g.. process improvement tools, health & safety, etc.
0.	No cell / department activity board in use.

Contractual requirements

As well as working with the supplier on lean activities the team also help to ensure the supplier is contractually compliant with our customers requirements

<p><i>Internal Fracas</i></p> <ul style="list-style-type: none"> Look For Method for collecting data Trend analysis Corrective actions timely Preventative actions with verification <p>Display Information</p>	<p><i>External Fracas</i></p> <ul style="list-style-type: none"> Look For Method for collecting data Trend analysis Corrective actions sent to Customer / Supplier <p>Display Information</p>	<p><i>Monthly FRB's</i></p> <ul style="list-style-type: none"> Look For Minutes from meetings Actions assigned to people (time bound) Follow up on previous actions <p>Display Information</p>	<p><i>Quarterly Reports</i></p> <ul style="list-style-type: none"> Look For <p>Display Information</p>	<p><i>ATPs Assessed</i></p> <ul style="list-style-type: none"> Look For Product verification process Historical data being stored Alignment to BAE test requirements <p>Display Information</p>
<p><i>Change management system</i></p> <ul style="list-style-type: none"> Look For Robust configuration control Appropriate approval authorities Method of issuing/updating shop docs <p>Display Information</p>	<p><i>Supply Chain Optimisation</i></p> <ul style="list-style-type: none"> Look For Evaluation of supplier performance Performance targets established <p>Display Information</p>	<p><i>Improvement plan & Management Commitment</i></p> <ul style="list-style-type: none"> Look For should Improvement plan and commitment to <p>Display Information</p>	<p><i>KPI's</i></p> <ul style="list-style-type: none"> Look For KPI's displayed internally KPI Targets <p>Display Information</p>	<p><i>Benchmarking</i></p> <ul style="list-style-type: none"> Look For <p>Display Information</p>

These extra areas are assessed in addition to the lean assessment

Supplier development scorecard

From the initial assessment a development scorecard is completed. This scorecard is used to:

- 1) Highlight areas for improvement.
- 2) Give a point to gauge improvements against
- 3) Provide a maturity score

Supplier name				
<p>Benchmarking How does the organisation gauge its performance against other companies.</p> <p>4. Benchmarking activities have been used to set future targets within business plans.</p> <p>3. The organisation has benchmarked itself against industry standards and world class organisations.</p> <p>2. Benchmarking activities have taken place against other company sites.</p>				
<p>Visual Control Improvement Activities Board</p> <p>• Look For Lead display board Mechanism for employee suggestions Ownership of board (includes of team meetings) Typicality and active use of board Relevant information</p> <p>2</p> <p>Display Information</p>	<p>Visual Control Skills matrices</p> <p>• Look For Visible skills matrix Process for identifying current and future skills Operator accountable to complete computerized Training Programme (eg. PSP) Linked to KPI's</p> <p>1</p> <p>Display Information</p>	<p>Visual Control Production Control Board</p> <p>• Look For Major Area's Bar Charts (Short-term limits) Gantt (Medium-term limits) Major Area's Job Cards (Overall progress of Production Plan) Job-Area's Job Cards (Control panel)</p> <p>1</p> <p>Display Information</p>	<p>Visual Control Quality Defects</p> <p>• Look For Planned vs actual target levels Quality improvement plan Customer involvement Cost of Quality (ie. Defectives, Rework/Repair) Analysis of reasons for error</p> <p>3</p> <p>Display Information</p>	<p>Visual Control Inventory</p> <p>• Look For Displayed planned vs actual Target level (Business Plan) Agreement plus Team understanding Flowing inventory</p> <p>1</p> <p>Display Information</p>
<p>Visual Control Man-hour Reduction</p> <p>• Look For R.O.M.I.Ms (hour reduction) Agreement plus Standard V's control line Visible flow of material Method in which targets are set</p> <p>3</p> <p>Display Information</p>	<p>7 Wastes Processing</p> <p>• Look For Published facts and figures Approach to job standardisation Appropriate use of tooling Multiples of operations Machinery operating during breaks</p> <p>2</p> <p>Display Information</p>	<p>7 Wastes Movement</p> <p>• Look For Transportation agreement Use of standard operations Mechanism for providing cost job Minimum distance moved multiple Approach to standard work</p> <p>3</p> <p>Display Information</p>	<p>7 Wastes Waiting Time</p> <p>• Look For Unbalanced loading (graph, cell, process) Operator waiting time agreement Mechanism for calculating the cost job Down time at shared facilities</p> <p>1</p> <p>Display Information</p>	<p>7 Wastes Overproduction</p> <p>• Look For Customer order V's initial production Production order in process and replacement Inventory in stock parts area E.O.I. (E.O.I.) The Order mechanism</p> <p>3</p> <p>Display Information</p>
<p>7 Wastes Quality Defects</p> <p>• Look For First-time-right operations on Job cards Operator agreed process (JIT Agreement) Use of standard tooling Distance, steps, gait, pace, pressure control</p> <p>2</p> <p>Display Information</p>	<p>7 Wastes Inventory</p> <p>• Look For E.O.I. (E.O.I.) methodology Customer order V's initial production Use of standard Batch size defined by supplier Lead time reduction plan</p> <p>2</p> <p>Display Information</p>	<p>7 Wastes Transportation</p> <p>• Look For Problem flow (with the process) Distance between facilities Transportation with Ducks leading Re-usable storage needs</p> <p>2</p> <p>Display Information</p>	<p>5S (Housekeeping) Address and Place</p> <p>• Look For Ownership of area / cell / department Frequency of 5S assessment Use of check sheets In line operator assistance Maintenance schedule displayed</p> <p>2</p> <p>Display Information</p>	<p>5S (Housekeeping) Environment</p> <p>• Look For Signage or markings Colour coding Lighting Transmission from communication Standard board / display</p> <p>3</p> <p>Display Information</p>
<p>Set-Up Reduction</p> <p>• Look For Visible display of actual V's target JIT training documents Benchmark facilities Published V's operations with long set-up times Change the set-up cards</p> <p>2</p> <p>Display Information</p>	<p>Standardised Job</p> <p>• Look For Process for developing method and tool Standard "Operator" standard approach Use of diagrams Preparing the method and times are reviewed</p> <p>3</p> <p>Display Information</p>	<p>7 Quality Tools</p> <p>• Look For IPC Application Process mapping Pareto / Correlation diagrams Checks and other analysis Pareto analysis</p> <p>2</p> <p>Display Information</p>	<p>7 Quality Tools Process Control</p> <p>• Look For In-line SPC methodology understood? In-line evidence of process control (flowchart) What problem solving tools are being used How training has been provided Are the applications in control</p> <p>2</p> <p>Display Information</p>	<p>Kanban</p> <p>• Look For 2 Bin System Bin/Tray Kanban cards Links to customer and supplier Production and flow production applications</p> <p>3</p> <p>Display Information</p>
<p>Internal Fracas</p> <p>• Look For Monthly reviewing this Team meeting Customer order flow Procedures defined with guidelines</p> <p>4</p> <p>Display Information</p>	<p>External Fracas</p> <p>• Look For Standard reviewing this Team meeting Customer order - report to Customer / Supplier</p> <p>3</p> <p>Display Information</p>	<p>Monthly FRB's</p> <p>• Look For Monthly team meeting Action assigned to people (this board) Follow up on previous action</p> <p>2</p> <p>Display Information</p>	<p>Quarterly Reports</p> <p>• Look For</p> <p>2</p> <p>Display Information</p>	<p>ATPs Assessed</p> <p>• Look For Production cycle time process Historical data being stored Agreement to BAE for requirements</p> <p>4</p> <p>Display Information</p>
<p>Change management system</p> <p>• Look For Robust changeover control Appropriate approval authority Method of controlling key data</p> <p>1</p> <p>Display Information</p>	<p>Supply Chain Optimisation</p> <p>• Look For Evidence of regular performance Performance targets established</p> <p>0</p> <p>Display Information</p>	<p>Improvement plan & Management Commitment</p> <p>• Look For Shared improvement plan and commitment to</p> <p>4</p> <p>Display Information</p>	<p>KPI's</p> <p>• Look For 90% displayed monthly 90% target</p> <p>4</p> <p>Display Information</p>	<p>Benchmarking</p> <p>• Look For</p> <p>4</p> <p>Display Information</p>

KPI Overview	
Process improvement	77.78%

Development of a joint action plan

After the initial assessment an action plan is developed to improve the initial score.

Last Saved 24/03/2009 09:18

On Schedule

Pending and late

Action closed on time

Action closed late

Target

Dates Missing

New Slip Target

Joint Action Plan Tracking Sheet R2

Company Involved with JAP Tracking Sheet	12 Month JAP OTD	Total Actions	Current Late	Not Started	Late High Priority Tasks	Action Date Info Missing
BAES	66.67%	2	0	0	0	0
	60.00%	7	2	0	0	0

Add Additional Rows On End Of Sheet

Insert Rows Between Existing Actions

Delete Rows

Act	Prior	Description		Company	Owner	Assist	Start D	Target D
1	Medium	External focus	30 quality database currently used	Development			01/12/08	31/05/09
3	Medium	Tread analysis	Treading only done on carpet	Development			01/12/08	30/04/09
4	Medium	Change management system	Process in place	Development			08/11/08	15/05/09
6	Medium	Alignment of build documents to Purchase order	Controlled by configuration management system	Development			08/11/08	15/05/09
8	Medium	Commitment to improvement plan	Extra resource employed, progress against plan to be reviewed	Development			28/11/08	20/03/09
10	Medium	Review of T wastes	No formal review of T wastes evident	Development			30/01/09	30/04/09
13	Medium	Valve stream mapping for ISS area	No valve stream map in place	Development			05/01/09	31/08/09
14	Medium	Supply chain optimization plan	Supply chain optimization plan in place, looking for review against plan	Development			12/11/08	30/04/09

The supplier development team work closely with the supplier to complete actions on the plan.

Examples of development activities

5'S Training and Workshops

Before



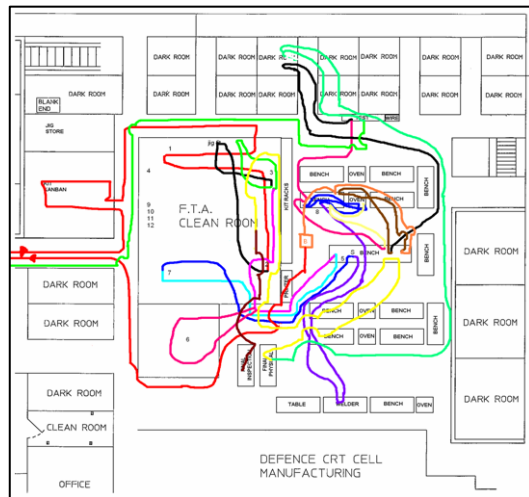
After



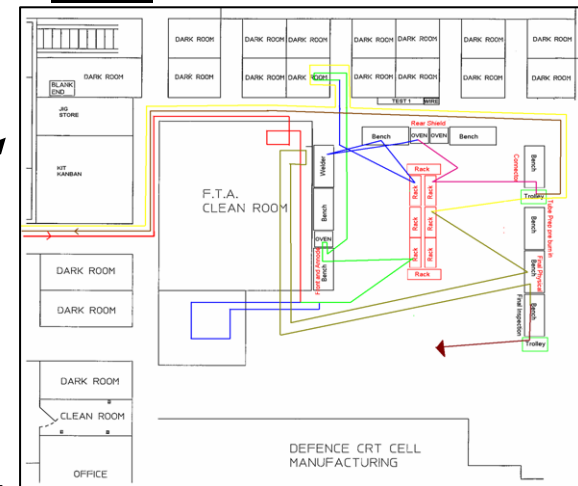
Examples of development activities

Production work flow analysis

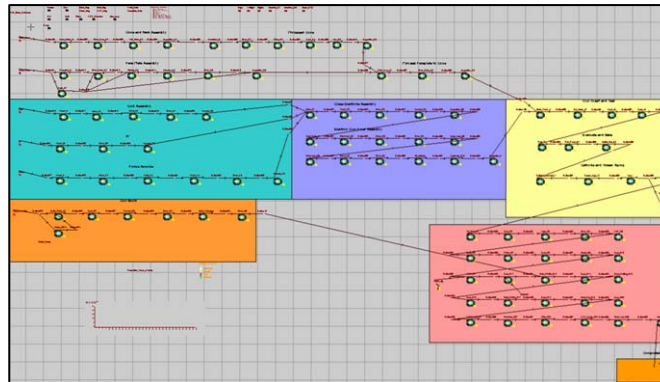
Before



After



Simulation



Examples of development activities

Development of FRACA systems

Fracas database

Current user: Simon Jaros
[Log out](#)

Filter by Opened Date: All

Reject No RI091163 Open

Current investigation status: Under Investigation

Details

Cust's reject Ref	Item No: 53300	Part description: ht-7014-12e
Opened Date: 09/03/2009	Reject Qty: 473	Batch number
Due Date: 08/04/2009	Batch Qty: 473	RMA No.
Reject type: Internal	Originator: New Tech Assembly	Vendor ID / Customer Acc No: N/A
Assigned To Dep Supplier	Assigned to Per: Martin Cook	Priority: Normal

Description of problem

not enough plating (gold measures between e and f should be d)

Stock/Delivery Error

Visual/ Process Error

Describe the error: plating not to spec

How should it be?: grade d

Dimensional / Design Error

Which dimension?:

What should it be?:

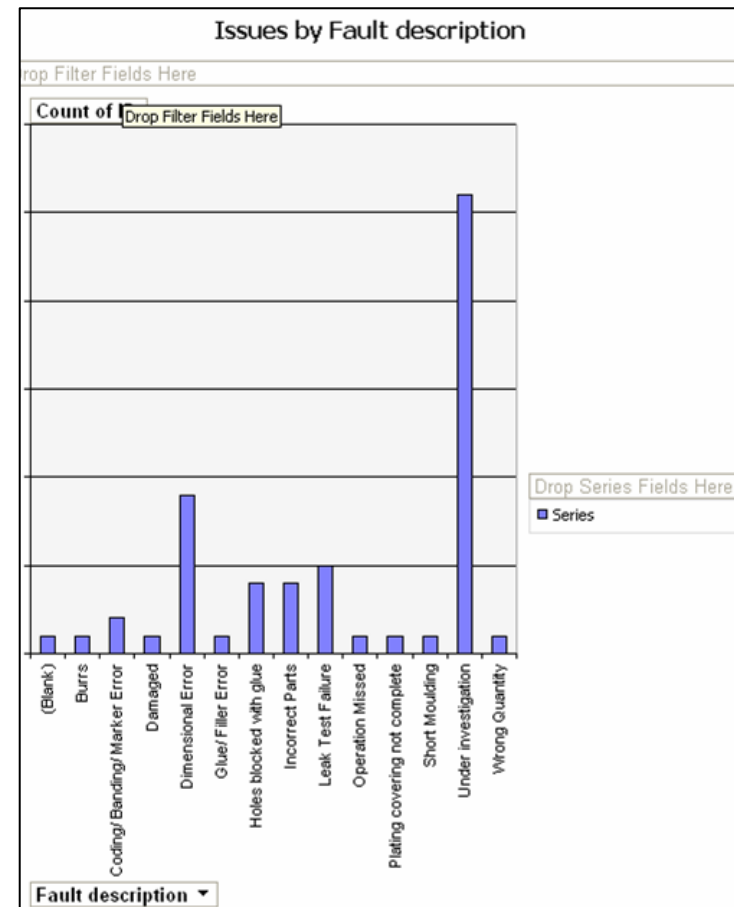
What does it actually measure?:

Print this report

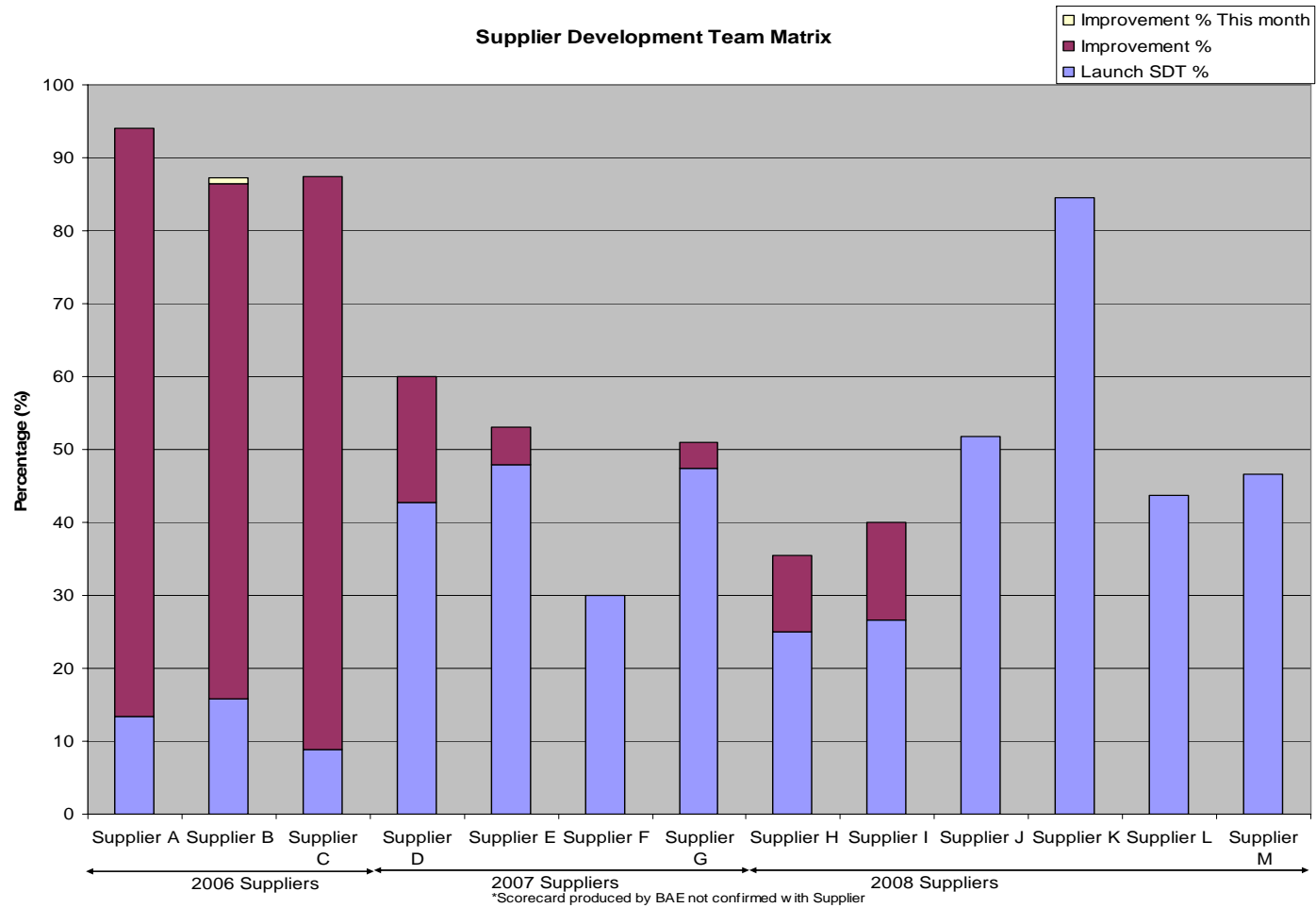
Containment

Notification: Customer informed Vendor informed

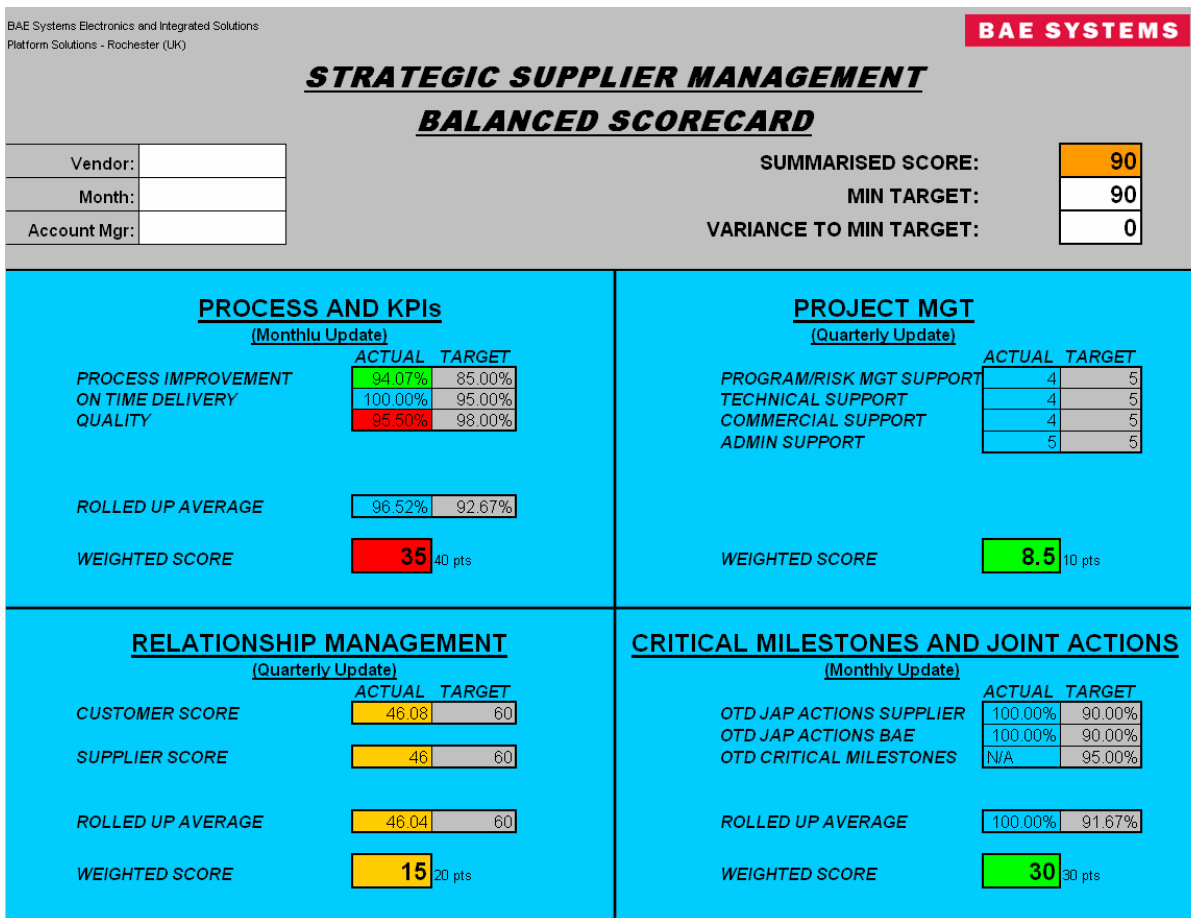
Record: 1 of 59



Measured improvements



Balanced scorecard



Consists of four quadrants

1. Process and KPI's
2. Project Management
3. Relationship management
4. Critical milestones and joint actions

Questions