Data, data, everywhere, but none of it matches

I didn’t have any accurate numbers so I just made up this one.

Studies have shown that accurate numbers aren’t any more useful than the ones you make up.

How many studies showed that?

Eighty-seven.

The company decided to invest a billion dollars based on your stupid, made-up numbers.

You’ve crushed my dreams of a better tomorrow. Now my life is a cold, wet slide to oblivion.

I finally made a difference at work.

How many victims?
Problem-1 Statement

• Customer satisfaction is being impacted by poor supply commitment reliability

• It is difficult to reconcile the demand forecast for the next 13-weeks with what is scheduled to be built, why?

• It is difficult to determine if JIT inventory buffer levels for key customers can be maintained

• It is difficult to understand how transit time (lead time) affect both demand fulfillment and buffer levels
Problem-1 Underlying issues

- Production Build plans are Not in a database but are published weekly on Excel spreadsheets.
- Each Production Planning Market Segment uses a different publication format.
- Transit times for customers are poorly understood at a corporate level, planning uses generic 3-days for all.
- There are multiple methods for calculating customer buffer requirements.
HeatMap – Requirements

- Granularity: per Customer, per tab number (9-digit)
- Correlate Future Forecast (either Customer FCST or Judged Demand) to Build Plan (BP) data
- Determine the anticipated Ending Hub Inventory on a weekly basis
- Calculate the DOI (Days of Inventory) Delta, in units, available to the customer
- Short term projection (13 weeks)
# HeatMap – Solution

## Main Pivot Table

| Customer | Data   | JUL 200001 | JUL 200002 | JUL 200003 | JUL 200004 | JUL Total | AUG 200002 | AUG 200003 | AUG 200004 | AUG 200005 | AUG 200006 | AUG 200007 | AUG Total | SEP 200002 | SEP 200003 | SEP 200004 | SEP 200005 | SEP 200006 | SEP 200007 | SEP 200008 | SEP Total | QTR Total |
|----------|--------|------------|------------|------------|------------|-----------|------------|------------|------------|------------|------------|------------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|-----------|----------|
| ACE      | Demand | 8,500      | 8,500      | 7,500      | 14,500     | 65,000    | 18,750     | 48,750     | 48,750     | 52,750     | 52,750     | 52,750     | 52,750    | 195,000   | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000 |
| End-Use-SM | Demand | 8,500      | 8,500      | 7,500      | 14,500     | 65,000    | 18,750     | 48,750     | 48,750     | 52,750     | 52,750     | 52,750     | 52,750    | 195,000   | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000    | 10,000 |
| AS       | Demand | 32,500     | 32,500     | 32,500     | 32,500     | 30,150    | 40,000     | 40,000     | 40,000     | 40,000     | 40,000     | 40,000     | 40,000    | 294,000   | 84,600    | 84,600    | 84,600    | 84,600    | 84,600    | 84,600    | 84,600    | 84,600    | 84,600 |
| FS       | Demand | 9,471      | 9,471      | 9,471      | 9,471      | 37,311    | 10,746     | 10,746     | 10,746     | 10,746     | 10,746     | 10,746     | 10,746    | 33,800    | 33,800    | 33,800    | 33,800    | 33,800    | 33,800    | 33,800    | 33,800    | 33,800 |
| GA       | Demand | 9,500      | 9,500      | 9,500      | 9,500      | 9,500     | 9,500      | 9,500      | 9,500      | 9,500      | 9,500      | 9,500      | 9,500     | 16,110    | 15,110    | 15,110    | 15,110    | 15,110    | 15,110    | 15,110    | 15,110    | 15,110 |
| Total Demand |       | 34,946     | 34,946     | 34,946     | 34,946     | 34,946    | 34,946     | 34,946     | 34,946     | 34,946     | 34,946     | 34,946     | 34,946    | 109,316   | 109,316   | 109,316   | 109,316   | 109,316   | 109,316   | 109,316   | 109,316   | 109,316 |
| Total Buffer Delta-SM |       | 4,027      | 4,027      | 4,027      | 4,027      | 4,027     | 4,027      | 4,027      | 4,027      | 4,027      | 4,027      | 4,027      | 4,027     | 14,119    | 14,119    | 14,119    | 14,119    | 14,119    | 14,119    | 14,119    | 14,119    | 14,119 |
HeatMap – User Views & Interfaces

1. Limit Query Data
2. Configure Pivot Data
3. Configure Pivot Table

Drilldown
HeatMap – Hub Inventory (Seagate Math)

COB Last Wk (Wk 0)

OnH Last Wk (100)
InT Last Wk (100)
AtF Last Wk (100)

Current Wk (Wk 1)

FC This Wk (100)
BP This Wk (200)

Next Wk (Wk 2)

FC Next Wk (150)
BP Next Wk (150)

Hub Inventory

Beginning Inv (300)
BP This Wk (200)
FC This Wk (100)

Ending Inv (400)
BP Next Wk (150)
FC Next Wk (150)

Start with all of WWFGI from previous week
Add this week's build
Subtract this week's forecast, what's left is ending inventory

Start with last week's ending inventory
Add this week's build, Subtract this week's forecast

© Seagate Confidential
HeatMap – Hub Inventory (CM-Customer Math)

COB Last Wk (Wk 0)

OnH Last Wk (100)
InT Last Wk (100)
AtF Last Wk (100)

Current Wk (Wk 1)

FC This Wk (100)
BP This Wk (200)

Next Wk (Wk 2)

AtF Last Wk (100)
Beginning Inv (100)
FC Next Wk (150)

Wk After Next (Wk 3)

FC 2nd Wk (200)
BP 2nd Wk (100)

Beginning Inv (200)

End Inv (100)

Ending Inv (100)

OnH: On-hand
InT: In-transit
AtF: At-Factory
FC: Forecast
BP: Build Plan

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HeatMap – Results

• Account management was able to better justify their arguments with planning on fulfillment issues
• The dysfunctional level of the groups/managers in the Demand-Fulfillment process increased dramatically
• Much better understanding of problems and thought process for the different groups was realized
• Database mapping and spreadsheet inconsistencies made the model hard to maintain
• The project to create a formal application and database for production planning was accelerated
• Heatmap was discontinued after 6-months
Product Production Scenario Planning
Problem-2 Statement

- During times of severe allocation (demand significantly exceeds supply) Sales and Operations could not agree on what product to build.
- Maximum quarterly profit margin was dependent on the type of manufacturing constrain limiting supply.
- Appeasing large corporate accounts required at least a limited amount of lower margin product be built.
- Business strategy required that certain product be favored over outers regardless of margin (e.g., capacity, target market such as consumer products or retail, etc.).
Problem-1 Underlying issues

- Again forecast, product margins, constraints stored in independent databases or no database
- Poor agreement on what product cost should be used (standard cost, actual cost, others)
- Poor agreement on which customers should be prioritized over others
- Complexity of variables made it hard to quantify choices/options (scenario planning)
Model Highlights

- The application was developed to enable **scenario planning** for next quarter Glass Media and Effective Test Time* constraints.

- Developed models to maximize profit for both 2.5” products (glass media supply constraint) and 3.5” products (test time constraint):
  - Demand Plan input: Rev Plan from Dec/Jan Outlook/Manu forecast
  - Pricing input: Rev Plan from Dec/Jan Outlook
  - Cost input: CMC Update from PLM
  - Media and Effective Test time constraint data from Factory POR (Plan of Record)
  - Customer Priority from PLM
  - ESG uses dedicated Gemini while NSG and PSG share the remaining Gemini resource

- Goal: Work with PLM to analyze different fulfillment opportunities for customer-product-linearity decisions that maximize profit:
  - Ability to rapidly alternate between different cost (Std/CMC/TVC/MLB) and pricing measures (ASP/AUP)
  - Quickly alter customer and product attribute priorities

* Effective test time = Test Time / Yield
Scenario Modeling Application

Supply Optimization

<table>
<thead>
<tr>
<th>Constraint</th>
<th>ES6</th>
<th>NSG/PS6</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Max</td>
<td>143,353</td>
<td>4,218,008</td>
<td>59,361,361</td>
</tr>
<tr>
<td>Supply Used</td>
<td>809,346</td>
<td>3,258,063</td>
<td>62,726,243</td>
</tr>
<tr>
<td>Demand Min</td>
<td>997,056</td>
<td>2,581,968</td>
<td>18,473,826</td>
</tr>
<tr>
<td>Demand Max</td>
<td>995,217</td>
<td>5,992,440</td>
<td>46,918,365</td>
</tr>
<tr>
<td>Excess Supply</td>
<td>245,217</td>
<td>879,223</td>
<td>9,125,118</td>
</tr>
</tbody>
</table>

Effective Certification Test-time vs. Gemini Capacity

<table>
<thead>
<tr>
<th>Constraint</th>
<th>MAY</th>
<th>MAY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Max</td>
<td>143,353</td>
<td>4,218,008</td>
<td>59,361,361</td>
</tr>
<tr>
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<td>809,346</td>
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</tr>
<tr>
<td>Excess Supply</td>
<td>245,217</td>
<td>879,223</td>
<td>9,125,118</td>
</tr>
</tbody>
</table>

Wyatt Holiday 320G Minimum Fulfillment

<table>
<thead>
<tr>
<th>Constraint</th>
<th>MONTHS</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Forecast</td>
<td>68,596</td>
<td>40,900</td>
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<tr>
<td>Minimum</td>
<td>5,447</td>
<td>5,675</td>
</tr>
<tr>
<td>Fulfilled</td>
<td>9,665</td>
<td>35,365</td>
</tr>
</tbody>
</table>

Business Objectives

- Revenue: $8,393,933
- Profit: $5,203,206
- Opti Qty: 977,756
- Demand: 901,085
- Fulfillment: 94.8%
- Std Margin: $79

Demand - Non-Perishable

<table>
<thead>
<tr>
<th>SS Customer</th>
<th>PROD GRP</th>
<th>GB</th>
<th>ST Model</th>
<th>UNFILL DMD</th>
<th>DEMAND MT</th>
<th>EOH RQD MT</th>
<th>EOH DMD M</th>
<th>TOLL DMD M</th>
<th>OPTI ALLOC M</th>
<th>EOH DMD</th>
<th>EOH M</th>
<th>Profit</th>
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<td>600</td>
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<td>100.0%</td>
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<td>100.0%</td>
<td>100.0%</td>
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<tr>
<td>ACE</td>
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<td>600</td>
<td>600</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Scenario Modeling Application

### Constraints

- **Objective:** Max Profit
- **Standard Margin** \( \times \) **Allocation Qty**

### Manipulate Variables

<table>
<thead>
<tr>
<th>SSD Customer</th>
<th>PROD GRP</th>
<th>ST Model</th>
<th>BOH</th>
<th>DEMAND MTH</th>
<th>EOH Rqd Mth</th>
<th>TTL Dmd Mth</th>
<th>OPTI Alloc Mth</th>
<th>Unfilled Dmd Mth</th>
<th>EOH Mth</th>
<th>FullFill %</th>
<th>PROFIT ($)</th>
<th>Revenue ($)</th>
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<tbody>
<tr>
<td>ACE</td>
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<td>-</td>
<td>15,000</td>
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<td>7,250</td>
<td>-</td>
<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
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<tr>
<td>ACE</td>
<td>VYATT</td>
<td>ST100310AS</td>
<td>-</td>
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<td>-</td>
<td>200,000</td>
<td>70,000</td>
<td>39,000</td>
<td>-</td>
<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
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<td>ST30030210AS</td>
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<td>22,000</td>
<td>-</td>
<td>2,000</td>
<td>8,700</td>
<td>3,200</td>
<td>-</td>
<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
</tr>
<tr>
<td>ACE</td>
<td>CROCKETT</td>
<td>ST30030210AS</td>
<td>-</td>
<td>313,000</td>
<td>-</td>
<td>2,000</td>
<td>8,700</td>
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<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
</tr>
<tr>
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<td>VYATT</td>
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<td>4,000</td>
<td>15,000</td>
<td>8,000</td>
<td>-</td>
<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
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<td>-</td>
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<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
</tr>
<tr>
<td>ACE</td>
<td>VYATT</td>
<td>ST90001030AS</td>
<td>-</td>
<td>3,075</td>
<td>-</td>
<td>3,075</td>
<td>15,000</td>
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<td>-</td>
<td>85.0%</td>
<td>15,396</td>
<td>71,250</td>
</tr>
<tr>
<td>TOSH</td>
<td>CROCKETT</td>
<td>ST100310AS</td>
<td>-</td>
<td>820,000</td>
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<td>10,000</td>
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<td>50.0%</td>
<td>33,330</td>
<td>45,000</td>
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<tr>
<td>TOSH</td>
<td>VYATT</td>
<td>ST30030210AS</td>
<td>-</td>
<td>820,000</td>
<td>-</td>
<td>20,000</td>
<td>10,000</td>
<td>10,000</td>
<td>-</td>
<td>50.0%</td>
<td>33,330</td>
<td>45,000</td>
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<td>VYATT</td>
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<td>820,000</td>
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<td>20,000</td>
<td>10,000</td>
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<td>-</td>
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<td>10,000</td>
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<td>-</td>
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<td>33,330</td>
<td>45,000</td>
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<td>-</td>
<td>20,000</td>
<td>10,000</td>
<td>10,000</td>
<td>-</td>
<td>50.0%</td>
<td>33,330</td>
<td>45,000</td>
</tr>
</tbody>
</table>

Total:

- **4,188,248**
- **188,248**
- **414,949**
- **73,299**

**Total:** **95,197** **62,896**
## FW31 Manu Forecast Model Results

### Optimization Q4 2010 FW32 Scenario Summary - Seagate Confidential

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Revenue</th>
<th>Profit</th>
<th>Opti Qty</th>
<th>Demand</th>
<th>Fulfill%</th>
<th>Avg Margin / Unit</th>
<th>Avg Margin / Disc</th>
<th>BL Profit Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL1</td>
<td>$95,007,489</td>
<td>$7,056,303</td>
<td>913,637</td>
<td>837,877</td>
<td>98.0%</td>
<td>$6.22</td>
<td>$3.11</td>
<td>$0</td>
</tr>
</tbody>
</table>

**Description:** Baseline sets Retail-Bare fulfillment = 100% (no Q4 forecast for CSQ), Min fulfillment all other customers set to 0%

**Results:** 50% of Wyatt 320G total quarter forecast unfilled (12M of 26M); A, D, H, I

**Comments:** Glass media is dominant constraint for ESG/NSG products. As a result, test time for the quarter was not a constraint for ESG (has dedicated Gemini) or NSG/PSG (pooled Gemini) availability. This held true for all the scenarios described here.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Revenue</th>
<th>Profit</th>
<th>Opti Qty</th>
<th>Demand</th>
<th>Fulfill%</th>
<th>Avg Margin / Unit</th>
<th>Avg Margin / Disc</th>
<th>BL Profit Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL1A</td>
<td>$93,541,897</td>
<td>$6,020,503</td>
<td>913,637</td>
<td>837,877</td>
<td>98.0%</td>
<td>$6.20</td>
<td>$3.10</td>
<td>($35,800)</td>
</tr>
</tbody>
</table>

**Description:** Goal - Ensure a minimum fill rate to meet growing NSG 320G TAM. BL1 + Wyatt 320G min set to 75% of forecast

**Results:** 75% of Wyatt 320G fulfilled; 32% of Holiday 320G unfilled; D, H, I

**Comments:** By forcing a minimum level of Wyatt 320G, Holiday 320G, the next least profitable product, was impacted

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Revenue</th>
<th>Profit</th>
<th>Opti Qty</th>
<th>Demand</th>
<th>Fulfill%</th>
<th>Avg Margin / Unit</th>
<th>Avg Margin / Disc</th>
<th>BL Profit Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL1B</td>
<td>$90,333,055</td>
<td>$5,924,014</td>
<td>796,900</td>
<td>837,877</td>
<td>97.8%</td>
<td>$6.24</td>
<td>$3.12</td>
<td>($32,289)</td>
</tr>
</tbody>
</table>

**Description:** Progression of BL1A ensuring NSG 320G (Wyatt & Holiday) fulfillment min set to 75% of forecast

**Results:** Unfulfilled: 25% Holiday 320G & Wyatt 320G; 21% Holiday 160G; 7% Wyatt 160G (All Freebox-CE)

**Comments:** By enforcing a minimum 320G fill rate, NSG 160G becomes the next dominant fallout

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Revenue</th>
<th>Profit</th>
<th>Opti Qty</th>
<th>Demand</th>
<th>Fulfill%</th>
<th>Avg Margin / Unit</th>
<th>Avg Margin / Disc</th>
<th>BL Profit Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS1</td>
<td>$80,174,309</td>
<td>$2,170,558</td>
<td>502,011</td>
<td>837,877</td>
<td>97.3%</td>
<td>$6.25</td>
<td>$3.15</td>
<td>($65,745)</td>
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</tbody>
</table>

**Description:** Sets Customer NSG Tiers 1-4 min fill rate = 100%, 85%, 0%, 0% respec. Tier 1 = A, D, H

**Results:** Unfulfilled: 25% Wyatt 320G (Iomega, Latin America OEM); 16% Wyatt 250G (Microsoft); 12% Wyatt 160G (Freebox-CE)

**Comments:** By enforcing minimum customer tier fill rates, margin per disc dropped

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Revenue</th>
<th>Profit</th>
<th>Opti Qty</th>
<th>Demand</th>
<th>Fulfill%</th>
<th>Avg Margin / Unit</th>
<th>Avg Margin / Disc</th>
<th>BL Profit Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS1A</td>
<td>$79,151,368</td>
<td>$2,062,409</td>
<td>462,223</td>
<td>837,877</td>
<td>97.2%</td>
<td>$6.26</td>
<td>$3.15</td>
<td>($53,894)</td>
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</table>

**Description:** Combines BL1B (NSG 320G minimums of 75%) with NS1 (customer tier 1 and tier 2 minimums of 100% and 85% respec.)

**Results:** Small shift in product mix, but very close to NS1 results

**Comments:** By enforcing minimum customer tier and product fill rates, margin per disc dropped
Scenario Modeling – Results

• Discussions around production alternatives were quantifiable making it easier to discuss alternatives
• There was still resistance to reduce the number of high priority customers so very little optimization was realized
• Allocation period ended (switched to period over supply)
• Completely new process implemented the next time allocation
• Allocation tool use dormant for 1-year+, but it’s been revived 3-times so you never know
DFAT
Distribution Forecast Analysis Tool
Problem-3 Statement

- Distribution forecasting aggregates many smaller customers and involves forecast for a large number of products
- Forecasting is more variable and often appears unrelated to backlog (usually based on TAM goals)
- The weekly forecast process required greater than one-person week to complete and there was only one person assigned
- The forecast was imprecise
- Existing process tool had 38 documented steps, required an hour to produce a working copy
Problem-3 Underlying issues

- Again five separate datasets need to be correlated: forecast, shipments, inventory, backlog, available supply
- Data was in multiple reports and not indexed/categorized the same
- Input from sales was informal and different for each sales region
- Forecast application was old and manual entry of data was very time consuming
- Process tool used incomplete and unreliable data sources
Objectives

• Analysis of distribution forecasts with respect to business goals, backlog and supply

• Entry of distribution forecast and opportunity data into the Manugistics (Manu) data repository

• Analysis and entry are performed for all region sub-groups across all market segments

• Analysis updates must be completed within one day for both current quarter and next quarter
DFAT - Improve forecast analysis

- Assemble all relevant data sets in one place
- Provide ability to compare forecasts to available supply and identify opportunities for revenue improvement
- Provide ability to rapidly identify gaps between forecast and backlog
- Built-in linearity analysis, by week and month
- Automate roll-forward logic for weekly forecast misses
Tool Components

• User Instrument
  ▪ Correlates FCST and Opportunity with Supply and Backlog
  ▪ Facilitates entry of forecast quantities
  ▪ Creates CSV file for use with the loader

• SMC Loader
  ▪ Provides mechanism for batch loading Manu data
  ▪ Quantities loaded by Sub-group, PSP, PN and Fiscal week
DFAT - Rapid and accurate analysis
DFAT – Single Build, Wham-whams

[Image of computer interface with various options and selections]

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DFAT - Time, Accuracy, Output Improvement

Accuracy

- Able to match regional forecast to supply/backlog on a weekly basis
- Includes Opportunity complexity not in original process
- Initially possible once or twice a quarter and took 2-days to complete