The Deming Process Workbench: An Application at MCI

Tim R. Norton, Sr. Staff Member
Resource Modeling Group
MCI Telecommunications
(719) 535-1163
Tim_R_Norton@mcimail.com
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SHARE Summer 95
Session 1851

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Abstract

Techniques abound for doing all type of modeling, but how do you manage the process, regardless of the tools used? This paper describes a new organization, The Resource Modeling Group (RMG), using a Modeling Workbench based on the work of W. Edwards Deming. Using Deming's Process Workbench Model provides the RMG with a well documented methodology for capacity modeling activities. The emphasis of the paper is on establishing the process using the Process Workbench Model, rather than how to do the modeling.

The Capacity Planing Organization

Whenever a company becomes large enough to have a data processing organization, there is a need to plan for future computer growth. The group with this responsibility is generally referred to as Capacity Planning and produces a plan or equipment acquisition schedule on a regular basis. Within a Capacity Planning organization there are many functions to be performed to ensure that the plan for future requirements fully addresses the company's needs. There are many techniques for developing the plan, ranging from simple historical trend analysis to complex systems based on application modeling or benchmarks. While this paper is based on the technique of system level modeling, the overall principles can be used regardless of the actual technique used to produce the plan. Components of the Workbench, such as Standards, can be defined as part of the Workbench or the Workbench can reference other existing processes or documents. In addition, the article proposes the creation of The Resource Modeling Group (RMG) to provide capacity planning modeling services to other organizations. The RMG, using the principles described here, could be either a separate group to support the other organizations or a function within an already functioning capacity planning group.

Defining the Deliverable Products

As organizations move from the Initial or Chaos level of the Capability Maturity Model (CMM) to the higher levels, they begin to better define the products they produce and who their customers are (Humphrey 1990). The objective of this paper is to outline and discuss a technique for identifying and documenting all of the components an organization needs to produce their products. This technique is generally known as the "Deming Workbench" or as the "Deming Process Workbench" even though there are no specific references to it in the works of Deming (1986), but the concepts are discussed by Deming, Juran and Crosby (Thorne 1994-95 and Jones 1994-95). The specific diagram used in this papers was developed by the author based on the more simplistic diagram developed and used by the Quality Assurance Institute (QAI 1986),which has also been used by companies such as IBM (1995). The Workbench can be used to document any organization at any level in the CMM. In fact, the first step to building a robust process is to fully document the current situation without regard to improvement. Once all of the organizations involved agree that the

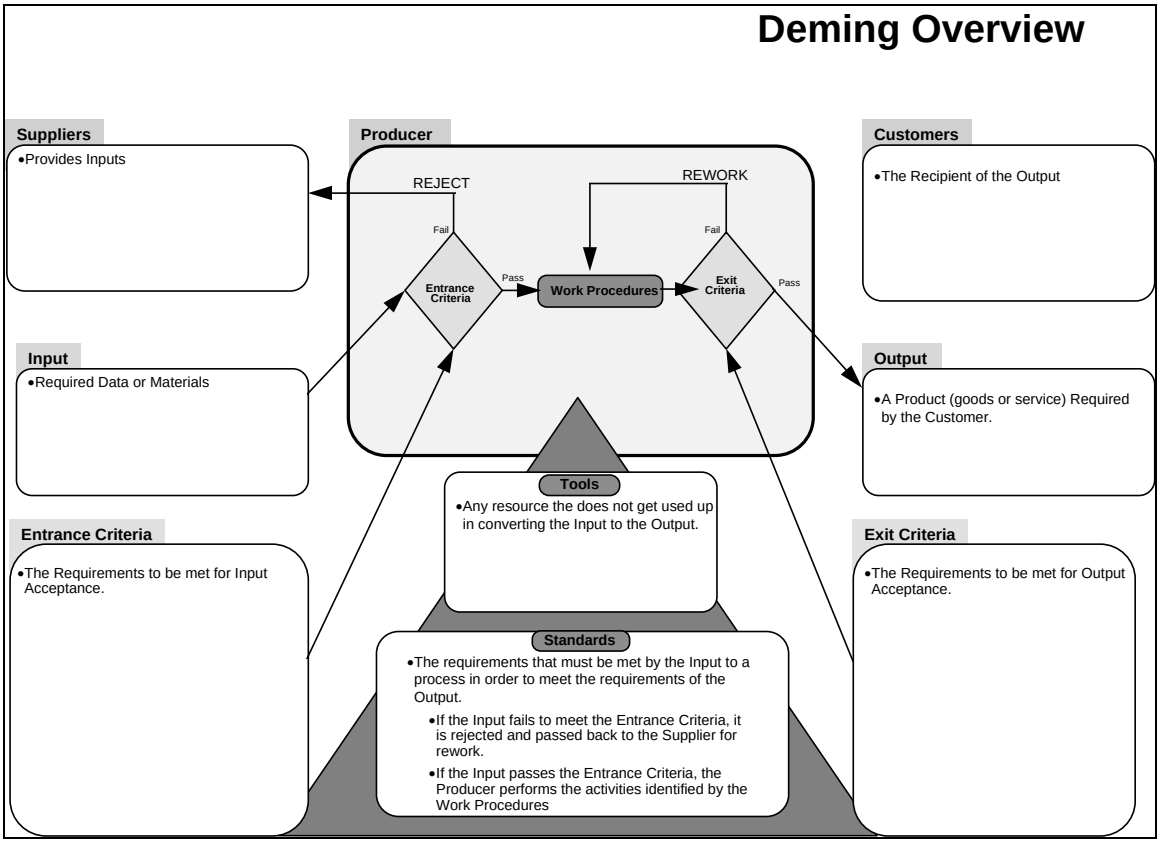

Figure 1: The Deming Process Workbench Model.

documentation accurately represents what **is** being done, then attention can be placed on what **should** be done.

Identify Customers and Suppliers

Delivering a product requires a clear understanding not only about what the product is, but also who wants it (the Customers) and who must provide input to make it happen (the Suppliers). Using the Deming Process Workbench model as a documentation vehicle allows an organization to define all of the products they plan to deliver and to also distinguish the ones that are currently available. This documentation acts as a starting point to begin the negotiations with the Supplier to provide the required inputs. This documentation also provides a focus for the Customers to validate the need for the products and to insure there are supplier organizations for everything needed to produce those products.

The Deming Process Workbench Model

What Is a Process Workbench

A process workbench is a method of process identification. It is a tool which illustrates the boundaries that define the scope of any given process. It defines the process components necessary for the producer to accomplish quality control, measurement and improvement (optimization). It also helps identify activities that comprise a process so that analysis can be performed.

Why Is It Important

Before a process can be managed, measured, or improved, it must be identified. The benefits of a process workbench include:

- Analysis and documentation of new and existing processes
- Vendor/supplier requirements identification

- A customer requirements negotiation vehicle
- Roles/responsibilities definition
- A definition of standards, procedures and measurement/metrics for quality control.
- Creation of a 'template' for a common communication platform.

Workbench Structure

Three Views of the Workbench

The Deming Process Workbench Model in Figure 1 shows the relationships between the process owner and the other organizations. The Workbench frame (box) represents the boundaries or span of control for the process. There are three views:

The Supplier views the workbench from the input side, providing the Producer with the Inputs meeting the mutually agreed upon Entrance Criteria.

The Customer views the workbench from the output side, utilizing the Outputs from the Producer. The Outputs must meet the mutually agreed upon Exit Criteria.

The Producer views the workbench from the inside and is responsible for providing the end product to the Customer. Work procedures inform the Producer what to do.

Structured Analysis Tool

The Deming Process Workbench is a structured analysis tool to assist in the definition of a process. Any process can be defined using this simple structure, which identifies the components of a process that relate to quality control.

Components

Input. The data and information required from the Suppliers to be transformed by a process into the required end product of that process. Any data or materials consumed in the process or that become part of the Output.

Entrance Criteria. Defines the required quality of the input in measurable terms. The Criteria determines if the Input provided for a request will be accepted and processed or rejected and returned. The Producer's Entrance Criteria for the Input should be the same as the Supplier's Exit Criteria on their Process Workbench.

Tools. The tools and products that the Producer will use, and therefore must be available, to produce the Output. Any resources that are not consumed in converting the inputs into the product.

Standards. The measurable definition of the Output product. The requirements that must be met by the input to a process in order to meet the requirements of the product. Standards also include any criteria or thresholds established and used by the Producer that are not part of the entrance or Exit Criteria.

Output. Any product (data, information, goods or services) required by the Customer. The Output (or Product) is the intended result of the process.

Exit Criteria. Defines the required quality of the output in measurable terms. The criteria determines if the Output provided for a request will be accepted or rejected by the Customer. The Producer's Exit Criteria for the Product should be the same as the Customer's Input Criteria on their Process Workbench.

Level of Detail

The steps of the procedure need to be detailed enough to identify all the tasks or activities required by the process, but not detailed to the extent of defining every technical task (e.g., what to do vs. how to do it). Other documentation or procedures can be referenced. If a organization currently uses a tool, system or process in developing the Product, it should continue to be used, and its use becomes part of the Workbench. For example, there may be a single Workbench to describe the process of producing a software product and refer to other models such as the COnstructive QUality MOdel (COQUAMO) or the Goal-Question-Metric (GQM). In this case the Inputs, Entrance Criteria, etc. would not be documented in the

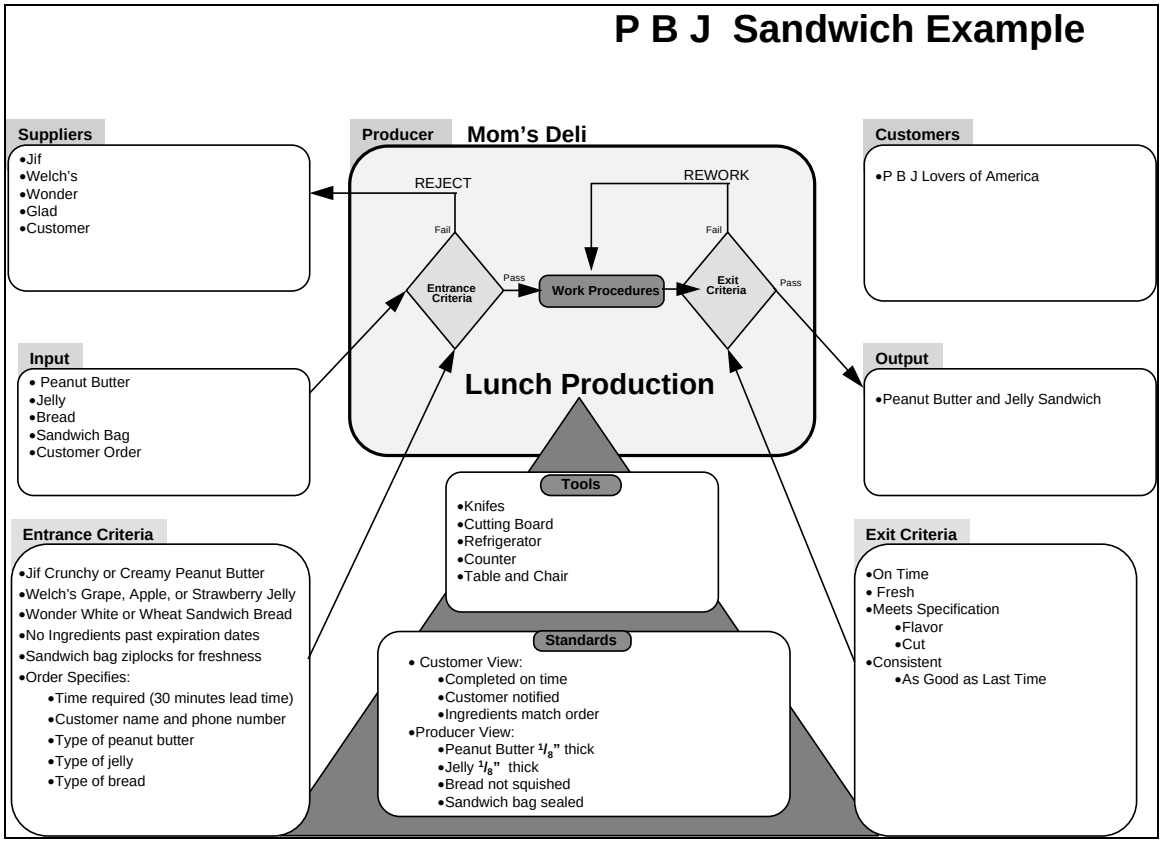

Figure 2: P B J Sandwich Example

Workbench, but in the COQUAMO or GQM process documentation.

Work Procedure

The Work Procedure is a description of process activities required to successfully convert the Input into the required Output. It references all components within the Workbench explaining how to verify that Entrance Criteria are met and what to do if they are not; sequence and dependency of all steps taken; the Tools necessary to transform the Input into Output; and how to verify that the Standards are met and what to do if they are not.

Process Owner

The Process Owner is a single individual who, through using a team approach, coordinates the multiple functions of a process, designates the process management team, and is ultimately accountable for the effectiveness of a process. Functional titles should be used instead of the names individuals.

P B J Sandwich Example

Figure 2 shows the Deming Process Workbench Model for Mom's Deli, that wonderful place where kids go to get their favorite lunch: The Peanut Butter and Jelly Sandwich. Mom (the Producer) makes the PBJ Sandwich (the Output) for the kids (the Customers) by using the things she bought (the Inputs) at the grocery store (the Suppliers) according the secret family recipe (the Work Procedure). Mom makes sure the sandwich is nutritious without excessive jelly (the Standards).

Operation Procedures

1. Upon receipt of customer order, verify that order meets the entrance criteria. If any required information is missing, contact customer for completion.

2. Check order against current supplies (inputs). Verify that all supplies are available and fresh (not beyond expiration date). Make note of any failure so that stocking process may be reviewed for possible improvement. Any new but defective supplies need to be set aside for return to the Supplier. If supplies are not available, contact customer and re-negotiate order.

3. Using two (2) slices of the bread requested, apply one (1) tablespoon of requested peanut butter to one slice of the bread using a clean case knife to spread smoothly. Be careful not to squish the bread. Apply one (1) tablespoon of requested jelly to the other slice of bread, using another clean case knife. Again, be careful not to squish the bread.

4. Carefully place the peanut butter slice of bread on top of the jelly slice.

5. Verify the completed product meets all standards. If defects are found, make note of the defects, determine the cause, and re-make the sandwich.

6. Place the sandwich in the sandwich bag and zip closed.

7. Notify the customer that the peanut butter and jelly sandwich is ready.

8. If order did not meet all of the exit criteria, make note of the failure and resolve with the Customer (i.e., re-make sandwich or promise to do better next time).

The Resource Modeling Group (RMG)

The Resource Modeling Group (RMG) provides services for other organizations based upon the premise that generalized system level modeling will provide better future hardware resource requirements than the more traditional trend analysis of historical data. The purpose of the RMG is to analyze the overall system environment and categorize the workloads executing on the system into broad groups of generally similar types. Then to grow each of these workloads at a rate appropriate to the business drivers for that group and validate that the group maintains an acceptable response time or through-put rate.

Direction

The direction of the RMG must be very future orientated and focused on capacity requirements assessment. All capacity requirement assessments should be ***predictive*** rather than reactive; to determine what will happen rather than what did happen. Therefore, the general direction is ***long-term*** since modeling for capacity assessments is for planning purposes.

Objectives

The objectives of the RMG are to validate that the capacity plan will install adequate resources in the time-frame required; predict the impact of that plan on the Service Level Agreements or Objectives; and respond to questions from other organizations as to the impact of hypothetical situations.

Capacity Plan Validation

Capacity Plan Validation is an analysis process to insure that the Capacity Plan provides the system hardware capacity required by the anticipated business growth or addresses other market driven situations. This can be done any one of several way, including key workload analysis, analysis of on-line applications or even projections of a medium priority workload on the assumption higher priority workloads will perform better.

SLA Impact

SLA Impact is the analysis of how the system will respond in terms measured by the Agreements negotiated between Data Processing and the user organizations or in terms of the Service Level Objectives that Data Processing uses to evaluate its own effectiveness. The analysis is of any changes, in such areas as hardware, software, configuration or business drivers that effect the service at the end users level.

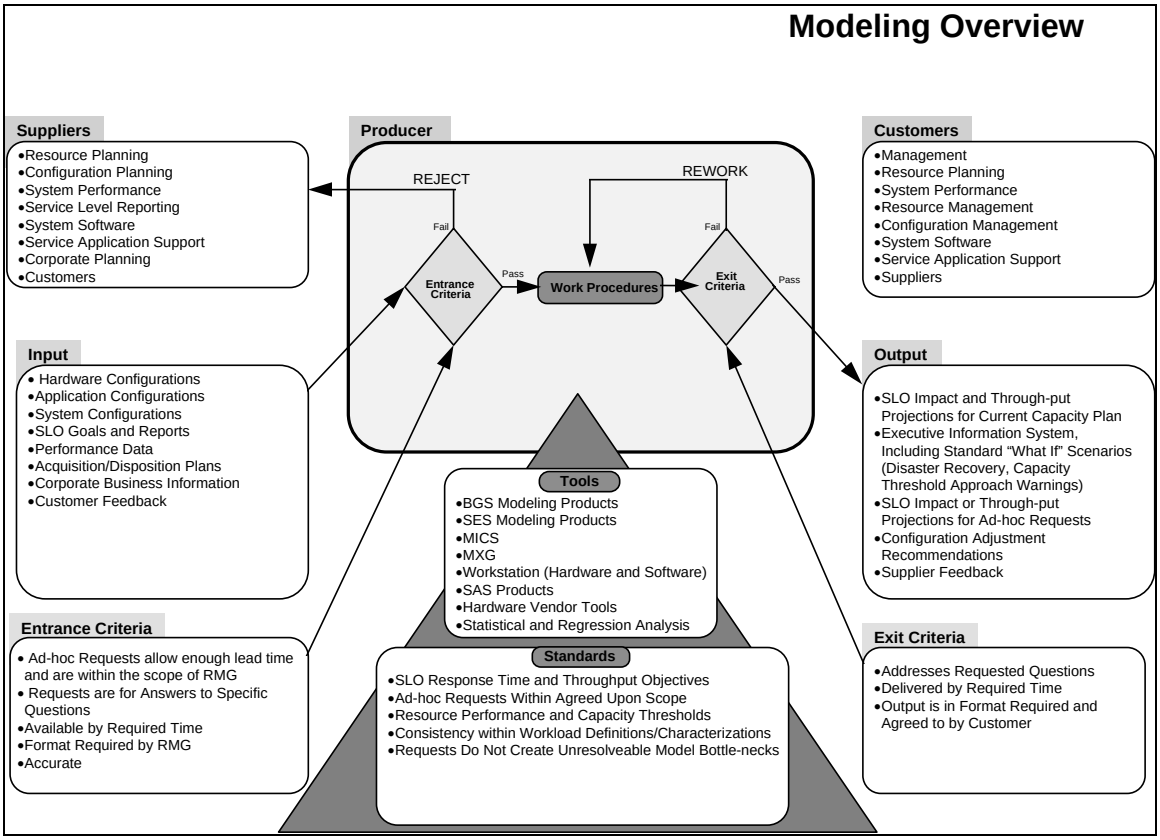

Figure 3: Modeling Overview Using the Deming Process Workbench Model.

"What If" Analysis

"What If" Analysis provides other organizations generalized answers to unique questions as well as for standard "What If" scenarios such as disaster recovery, workload balancing, business driver increase or capacity threshold approach warnings.

Modeling Overview

The Deming Process Workbench Model in Figure 3 shows the relationships between The Resource Modeling Group (RMG) and the other organizations. The workbench represents the boundaries or span of control for the RMG process. The Suppliers are the organizations that provide RMG with the required inputs and information to support the modeling techniques and tools used. The Entrance Criteria defines the required quality of the input in measurable terms. The criteria determines if the Input provided for a request will be accepted and processed or rejected and returned. The Tools are any of a number of modeling products either commercially available or in-house developed. The Standards are the measurements used to analyze the Inputs and produce the Output. The Customers are the organizations that require and make use of the Outputs provided by RMG. The Exit Criteria defines the required quality of the output in measurable terms and determines if the Output provided for a request will be accepted or rejected by the Customer. The Producer is the team Lead or Manager of the RMG.

Suppliers - Input - Entrance Criteria

Regardless of the type of Capacity Planning organization or type of computer systems used, there are certain functions that must be performed, either by independent organizations or as functions within smaller organizations. The Products or Outputs from these organizations are the Inputs to all of the processes in the RMG. The inputs are defined in the Workbench in terms (Entrance Criteria)

of what the Suppliers need to know. How the Inputs will be used in the Process (Work Procedures) is not addressed here, but is generally a separate procedures document. In the following examples, a mainframe MVS environment is used for illustrative purposes. These organizations and the information they provide can be mapped to the smallest organizations and even to a home personal computer where a single individual fulfills all of the roles.

Hardware Configuration Information

Hardware Configuration Information is supplied by the organization responsible for Configuration Planning. The Input is detailed information showing all system hardware installed in each data center, in both chart and report format. The major information required is:

- **LPAR Configurations**: What LPAR's are defined and what resources are assigned to each.
- **Channel Diagrams:** What devices are attached to each channel, in order, and to which LPAR(s) is the channel assigned.
- **ESCON Maps:** What is the topology of the fiber environment, including directors, trunks and patch panels.
- **Detailed Features for all Devices:** All device dependent information that effects the performance or capacity of the device.

Application Configuration Information

Application Configuration Information is supplied by the organization(s) responsible for Application Support. The Input is information for all applications in each data center detailing anything that impacts the ability to meet the application Service Level Objective (SLO) or limit the location where the application will function. The major information required is:

- **Application Configurations:** Documentation showing the resources used and/or required by each application, such as home LPAR's, dataset identification rules, shadowed file systems and specialized network requirements.
- **Workload Groupings (Application Level):** The definition of each application as one or more workloads sharing the same SLO's, including common names and both a current and historical database of the rules to determine what is included in each workload.
- **Application Characterizations:** The definition of how each application workload behaves; such as what is normal and what is unacceptable.
- **Application Business Drivers:** The business driver that will most accurately reflects the business volume fluctuations in each application. This relationship will change as functionality is added to the application.
- **Specific Application Requirements:** Any unique requirements of each application; such as specialized hardware like optical storage or very large memory requirements.

System Configuration Information

System Configuration Information is supplied by the organization responsible for Systems Software. The Input is detailed information showing all mainframe software installed in each data center. The major information required is:

- **Current Software:** What software, including version, is running in each LPAR.
- **Software Levels:** The historical and current level of all installed software on all LPAR's.
- **Software Installation Schedules:** The projected software installation schedule for all LPAR's.

Service Level Information

Service Level Information is supplied by the organization responsible for Service Level Reporting. The Input is detailed information showing all Service Level information for all mainframe based applications in each data center. The major information required is:

- **Service Level Objectives:** Database of the on-line response time and batch throughput objectives for each application.

- **Service Level Compliance:** The historical and current level of compliance of each application to the Service Level Objectives for that application. This information is to be provided both in report and database form, current to within one week.

- **Service Level Objective Changes:** Prompt notification, both written and database update, whenever any on-line response time or batch throughput objective changes.

Performance Data

Performance Data is supplied by the organization responsible for System Performance. The Input includes a database (such as MICS or MXG) where data is maintained in both at the summary and detail levels and is current to within one week. Other Inputs that may be required, depending on the modeling activity, are:

- **GTF Trace Data**, as needed, within one week of the request from RMG.

- Current and historical **Parmlib members** to be maintained such that the members (IPS, ICS and OPT) in effect for any given SMF/RMF data can be reliably found for use as input to a model (hardcopy is not acceptable).

- **Transaction activity and response times** to be maintained, in either the SMF 110 records for CICS or in database format for all other on-line transaction regions.

- **Database activity and response times** are maintained, in either database or report format, for all Adabas, DB2, DL/I, IMS and IDMS regions.

- Workload Groupings (LPAR Level) are maintained on-line such that, for any historical period that data exists, the Performance Groups and DASD volumes can be grouped in a model to match any Performance reports for the period.

Capacity Information

Capacity Information is supplied by the organization responsible for Capacity Planning. The Input is detailed lists showing when what hardware will be installed and removed from each data center. These plans need to show the actual configuration to be installed or removed including:

- **CPU's:** Model, Memory (main and expanded), Channels.

- **DASD:** Control unit and device models (including Cache and NVS sizes) with Device addresses and Channel connectivity (ESCON, parallel).

- **Tape:** Control unit and device models, Addresses, Features (ACL, Silo, floor, etc.) and Channel connectivity (ESCON, parallel).

- **Other:** Other hardware related information, such as Channel-to-channel connections, Network devices and Optical devices.

- **Vendor specifications** for new or "unannounced" hardware.

- **Detailed list** showing when any capacity will change at any data center (including current Acquisition/Disposition Plans).

Corporate Business Information

Corporate Business Information is supplied by the organization responsible for Corporate Planning. The Input is databased information containing current, historical and marketing predictions for the major business drivers or indicators. These drivers include any metric identified by the business products support or marketing organizations as being predictive of changes to any application workload. The drivers used by the chargeback billing system are the minimum acceptable drivers to be contained in the database. Examples of business drivers are:

- Number of orders per day/hour

- Number of product shipments by product type

- Number of customers
- Adjusted customer installs
- Number of employees
- Any metric usable to predict the future business

Customers, Output and Exit Criteria

The Outputs are agreed upon with the Customers involved and are documented in detail. The Customers generally control the form and delivery schedule of the Products because it is the customer organizations that have a use for the Products. There are a number of Products that a new RMG will find already desired by other organizations. These include:

SLO Impact for Current Capacity Plan

The SLO Impact for the current capacity plan is a set of charts, by LPAR, showing the current and projected service relative to the Service Level Objective (SLO) for each on-line application. This could also be based on Service Level Agreements (SLA's) if the agreements with the user organizations include response times and load limits.

Through-put Projections for Current Capacity Plan

The Through-put Projections for the current capacity plan is a set of charts, by LPAR, showing the current and projected service relative to the Service Level Objective (SLO) for each batch application. This could also be based on Service Level Agreements (SLA's) if the agreements with the user organizations include due-out times and re-run limits.

Executive Information System

The Executive Information System (EIS) is a workstation based graphical presentation system automatically updated and available to any interested manager.

Configuration Adjustment Recommendations

Configuration Adjustment Recommendations provide other organization with information about areas of interest. Each situation will require different output, but in general, it will provide the organization in the appropriate area with the information needed to evaluate and implement the recommendation.

Ad-hoc Requests

Ad-hoc Requests are special cases and must be addressed individually. However, standard "What If" scenarios (Disaster Recovery, Capacity Threshold Approach Warnings) can be developed and made available through the EIS to provide a generalized version of this information whenever it is needed.

Feedback

Feedback of the process is essential to improve the not only the products, but also the process itself. Every time either a Supplier fails to deliver an Input or a Customer is unhappy with an Output, the root cause should be identified and the Criteria adjusted. All three participants, the Supplier, the Producer and the Customer, must feel that the process accounts for their specific requirements and they are part of the process.

Supplier Feedback

Supplier Feedback is any information about the quality, usability or value of any product used as input to an RMG product. Any changes in the RMG process should be reflected in feedback requests to modify the products used by RMG, including the product itself or the entrance criteria.

Customer Feedback

Customers Feedback is any information about the quality, usability or value of any RMG product. This information should be solicited from the Customer as part of the ongoing continual negotiations. Any changes in the customers requirements or schedule should be reflected in feedback requests to modify the RMG product, the process or the exit criteria.

Required Tools

The tools and products that RMG can use are far too numerous to list fully here. They can be any tool that supports the modeling technique used by the RMG. The key point is that the tools and their uses should be fully documented to insure

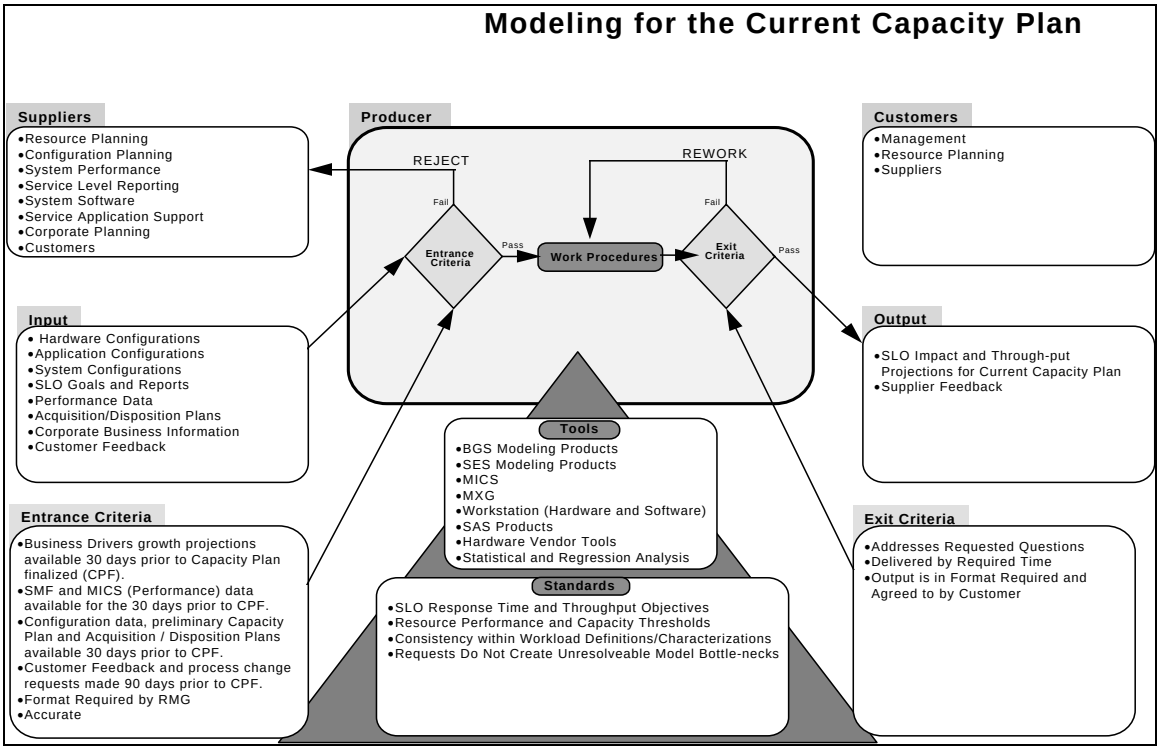

Figure 4: Validating the Capacity Plan.

that whenever there is a question about the usefulness of a given tool, the justification is tied back to the ability to produce the Outputs. At that point RMG's Customers will either help justify the tool and continue to receive the Output or cancel their request for that Output and RMG can stop producing it. A partial list of modeling tools is:

- BGS Modeling Products
- SES Modeling Products
- MICS
- MXG
- Workstation (Hardware and Software)
- SAS Products
- Hardware Vendor Tools
- Statistical and Regression Analysis

Standards Used to Measure Output Products

Standards are used to measure the output products and control the quality from within the process. There are many measurements, thresholds and guidelines that can be used as standards, and each organization will have many unique to that organization and to that company. Some examples of modeling standards are:

- Response Time and Throughput Objectives.
- What are the company goals and the customers expectations?
- Ad-hoc Requests Within Agreed Upon Scope. For example, printer problems cannot be addressed with a CPU model.
- Resource Performance and Capacity Thresholds.
- How busy can things get? (Both technically and politically).
- Consistency within Workload Definitions/Characterizations.
- Does everyone agree about what makes up each workload?
- Requests Do Not Create Unresolvable Model Bottle-necks.

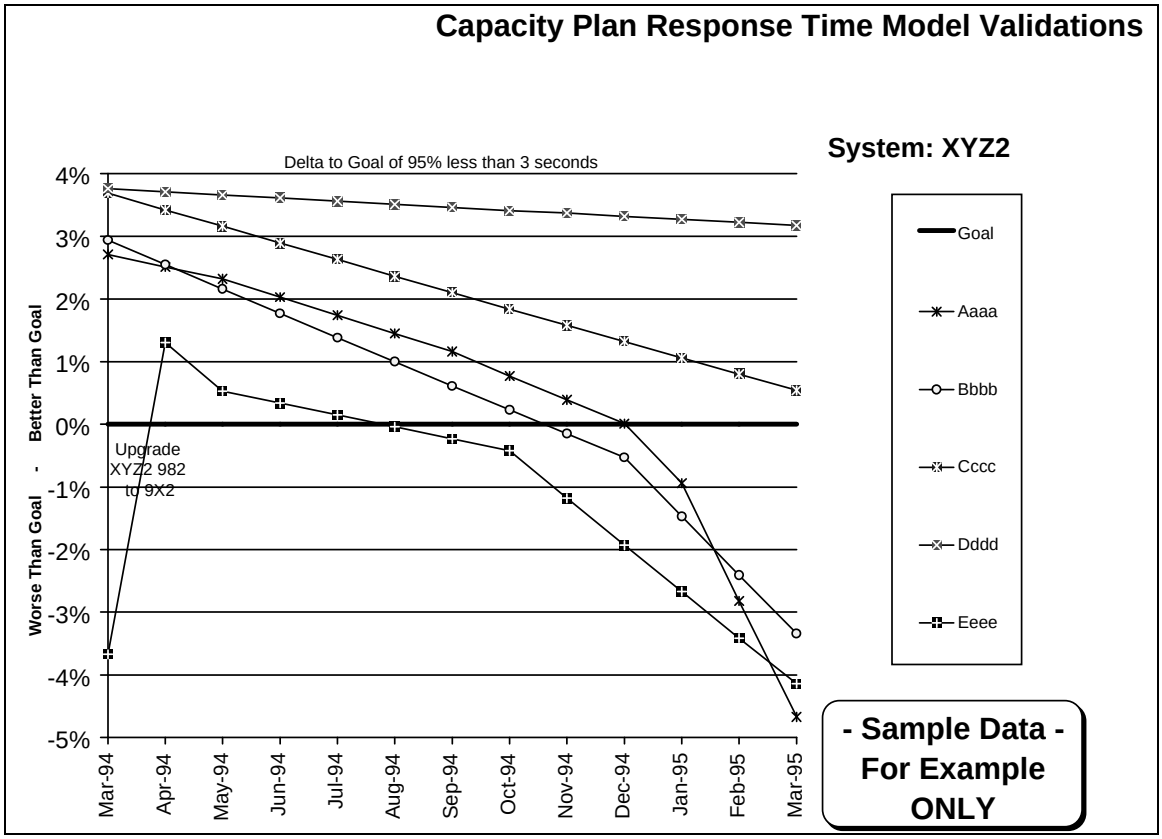

Figure 5: System Level Capacity Plan Response Time Model Validations.

• A request for CPU sizing may be worthless if the Big-Data-Base volume(s) are 100% busy.

Modeling for the Capacity Plan

The Deming Process Workbench Model in Figure 4 shows the process for validating the Capacity Plan produced by Resource Planning. Each of the Inputs and the Output were detailed earlier in this documentation. The Suppliers organizations provide RMG with information that impacts the Capacity Plan either from a capacity viewpoint, from a workload viewpoint or from a system control viewpoint. Inputs include those required to produce a model of each LPAR. The inputs also include a preliminary version of the Capacity Plan to be validated. The Inputs are required enough prior to the date the Capacity Plan is finalized (CPF) to allow RMG to produce a twelve month model of each LPAR. The preliminary Capacity Plan, delivered to RMG 30 days prior to CPF, is the plan that will be finalized. Any changes to the Capacity Plan after it is delivered to RMG will not be reflected in the Output delivered to Resource Planning (Entrance Criteria). The tools and products that RMG will use to produce the Output are the standard tools used within the process and do not require any last minute justification or installation. The Standards provide the measurable definition of the Output product. The Customers is Resource Planning. The Output is a set of charts (see Figure 5 for a sample chart), by LPAR, showing the level of impact to the Service Level Agreements (SLA) by major application. Each chart will show the current and projected service relative to the Service Level Objective (SLO) for each application. The Impact Charts must be delivered to Resource Planning five days prior to CPF (Exit Criteria). Failure of the Impact Charts to show SLO compliance for any LPAR DOES NOT constitute failure of RMG to validate the Capacity Plan. New or revised Capacity Plans can be validated, but as new

requests, which must meet the Entrance Criteria. The Producer is The Resource Modeling Group (RMG).

Capacity Plan Response Time Model Validations - System Level

The chart shown in Figure 5 is an extreme example showing the on-line internal response times for several applications running on one system. In this example, using the goal of 95% of the transactions less than 3 seconds, "Eeee" shows a sharp improvements in the projected response times when the system is upgraded. The other applications don't show improvement because they are not CPU constrained. In this case, the Capacity Plan does not address the needs of "Eeee" for the length of the plan (12 months).

Conclusion

The Process

Using The Deming Process Workbench provides a way to document a process and produce an easy to use reference showing the responsibilities of the Producer organization; the Suppliers and the Inputs they have committed to provide; and the resulting Products to be delivered to the Customers. The Workbench allows an organization to maintain their focus on their primary functions without digressing into areas not truly within their role. As other organizations develop their Workbenches, the Inputs and Outputs can be matched to insure the process is complete from beginning to end through all of the organizations. If a Producer discovers a Product that does not match to another organization's Input, that is something they should not be doing. On the other hand, finding an Input without any matching Output often explains why some organizations have trouble getting their Products completed or meeting schedules.

The Resource Modeling Group

The Resource Modeling Group can focus on providing modeling services to other organizations without becoming overwhelmed by the day to day application issues. When the Suppliers have agreed to provide the required Inputs and do so in a timely manor, the RMG can quickly produce a system level model to answer a question that is meaningful to the Customer. The Workbench helps insure that the RMG remains focused on producing Products that are really needed. The RMG helps insure that the other organizations remain focused on their applications or systems.

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Tim R. Norton
Larry R. Kayser
presented by
Linda Boyd

Resource Modeling Group
Systems Engineering
MCI Telecommunications Corporation
2424 Garden of the Gods Road
Colorado Springs, CO 80919

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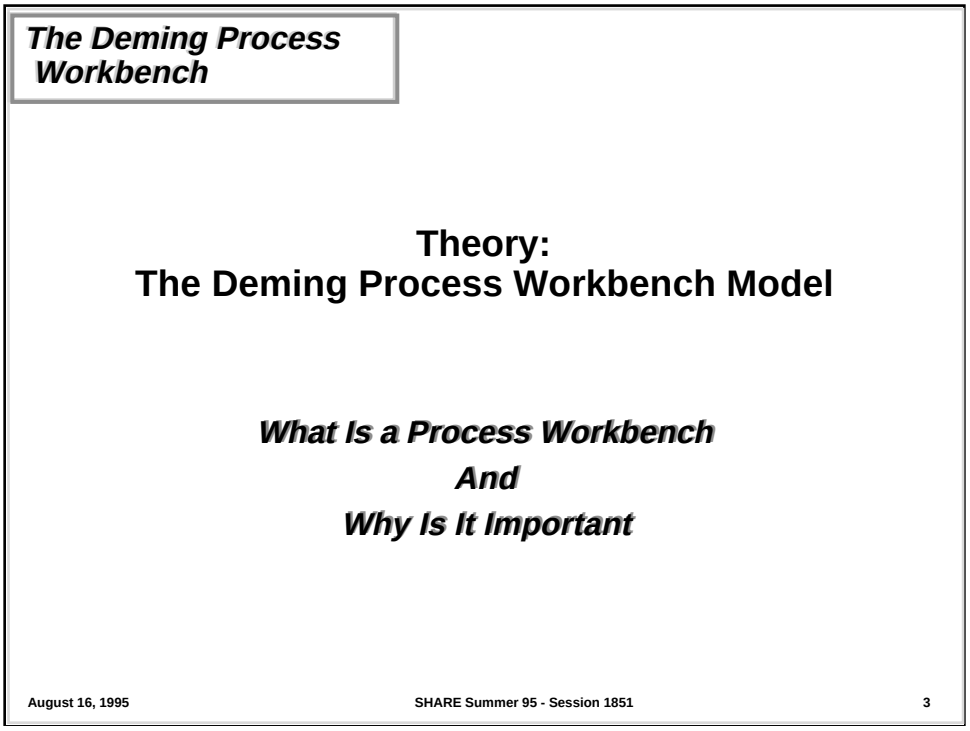
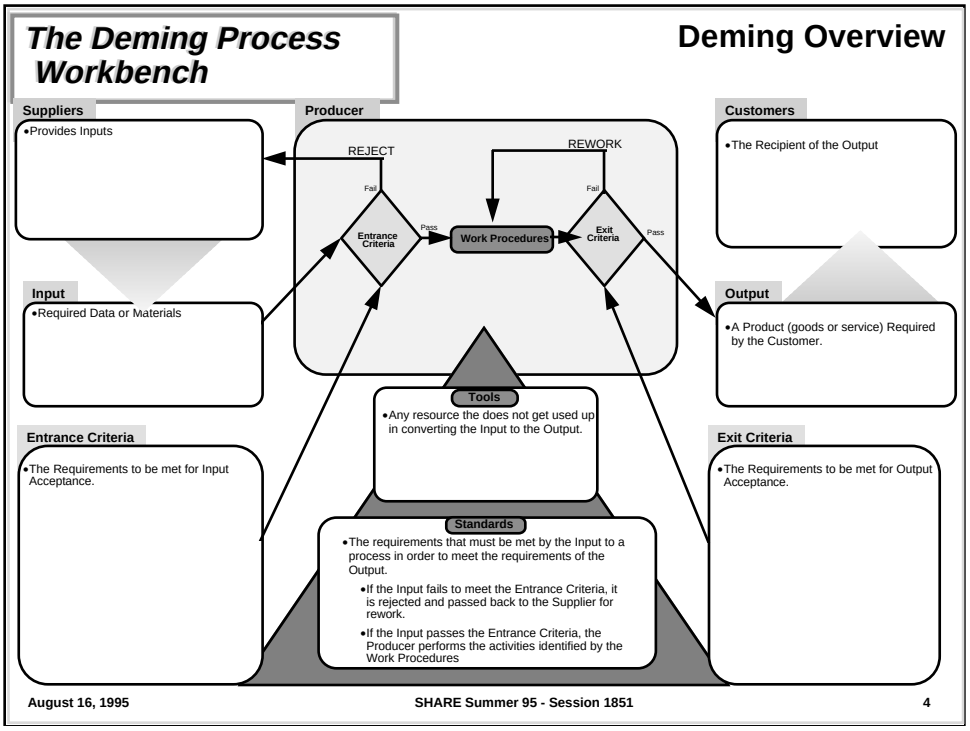
Agenda

- **Theory: The Deming Process Workbench Model**
- **Resource Modeling Group (RMG)**
- **Methodology: The RMG Workbench**
- **An Example - The Capacity Plan**
- **Coping with The Real World**



- **What Is a Process Workbench**
  - A process workbench is a **method** of process identification.
  - It is a **tool** which illustrates the boundaries that define the scope of any given process.
  - It **defines** the process components necessary for the producer to accomplish quality control, measurement and improvement (optimization).
  - It also helps **identify** activities that comprise a process so that analysis can be performed.
- **Why Is It Important -** The benefits of a process workbench include:
  - **Analysis** and **documentation** of new and existing processes
  - Vendor/supplier **requirements** identification
  - A customer requirements **negotiation** vehicle
  - Roles/responsibilities **definition**
  - A **definition** of standards, procedures and measurement/metrics for quality control.
  - It also provides a **'template'** for a common communication platform.

Before a process can be Managed, Measured, or Improved,
It must be identified.



The above Deming Process Workbench Model shows the relationships between The Producer and the other organizations.

- The workbench represents the boundaries or span of control for the process. There are three views: Supplier, Customer and Producer.

- **Suppliers:** View the workbench from the input side.
- **Input:** The data and information required from the Suppliers to be transformed by a process into the required end product of that process. Data or materials consumed in the process or that become part of the Output
- **Entrance Criteria:** Defines the required quality of the input in measurable terms. The criteria determines if the Input provided for a request will be accepted and processed or rejected and returned.
- **Tools:** The tools and products that the Producer will use, and therefore *must* be available, to produce the Output.
- **Standards:** The measurable definition of the Output product.
- **Customers:** View the workbench from the output side.
- **Output:** A product (data, information, goods or services) required by the Customer. The intended result of the process.
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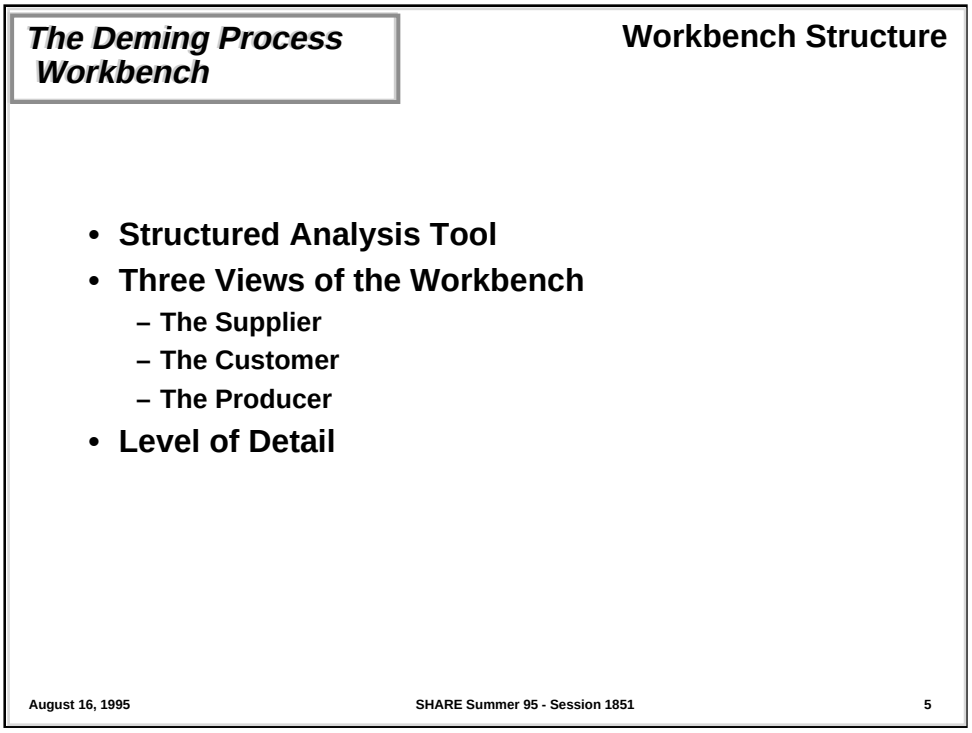

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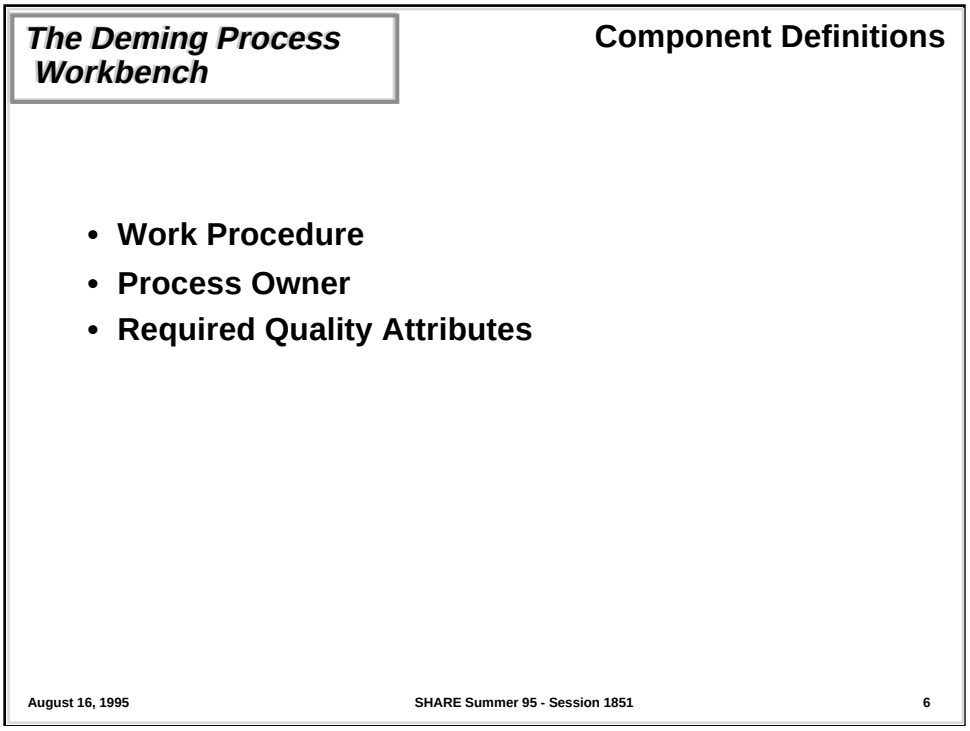

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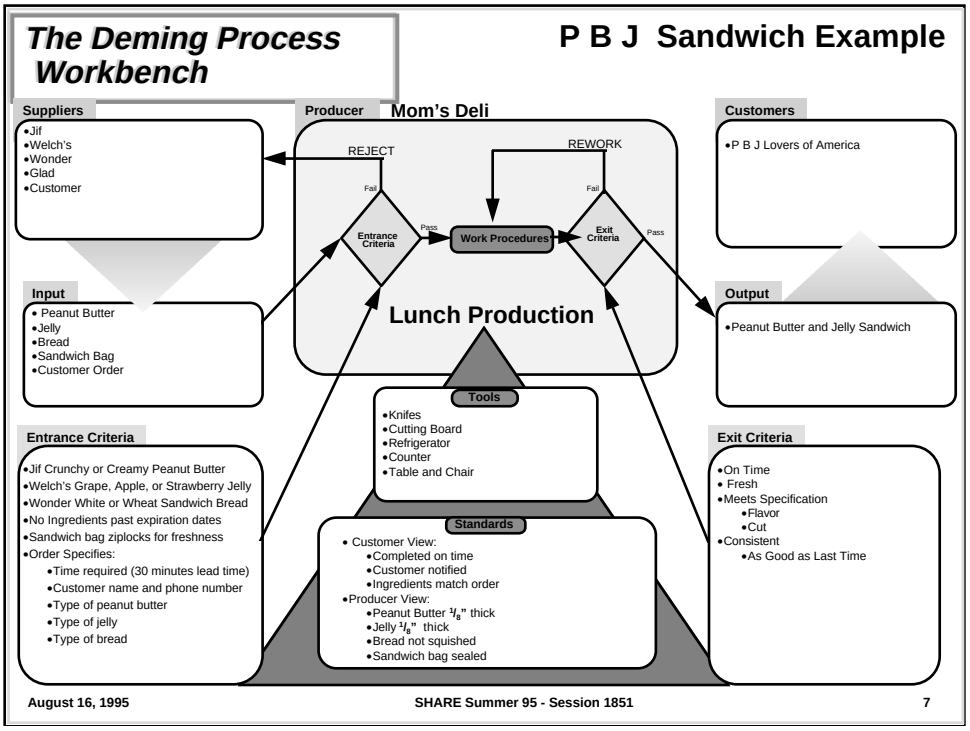

• P B J Sandwich Example:

Operation Procedures

1. Upon receipt of **customer order**, verify that order meets the **entrance criteria**. If any required information is missing, contact customer for completion.
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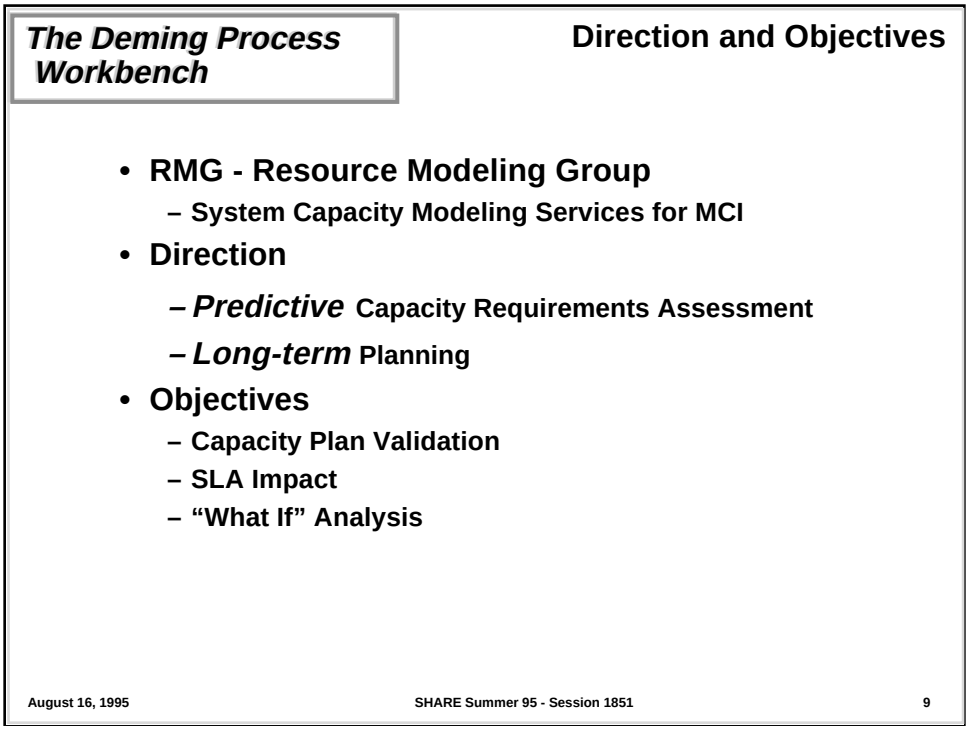
4. Carefully place the peanut butter slice of bread on top of the jelly slice.
5. Verify the completed product meets all **standards**. If defects are found, make note of the defects, determine the cause, and re-make the sandwich.
6. Place the sandwich in the **sandwich bag** and zip closed.
7. Notify the customer that the **peanut butter and jelly sandwich** is ready.
8. If order did not meet all of the **exit criteria**, make note of the failure and resolve with the Customer (i.e.., re-make sandwich or promise to do better next time).

The Deming Process Workbench

Methodology: The RMG Workbench

Purpose
and
Objectives



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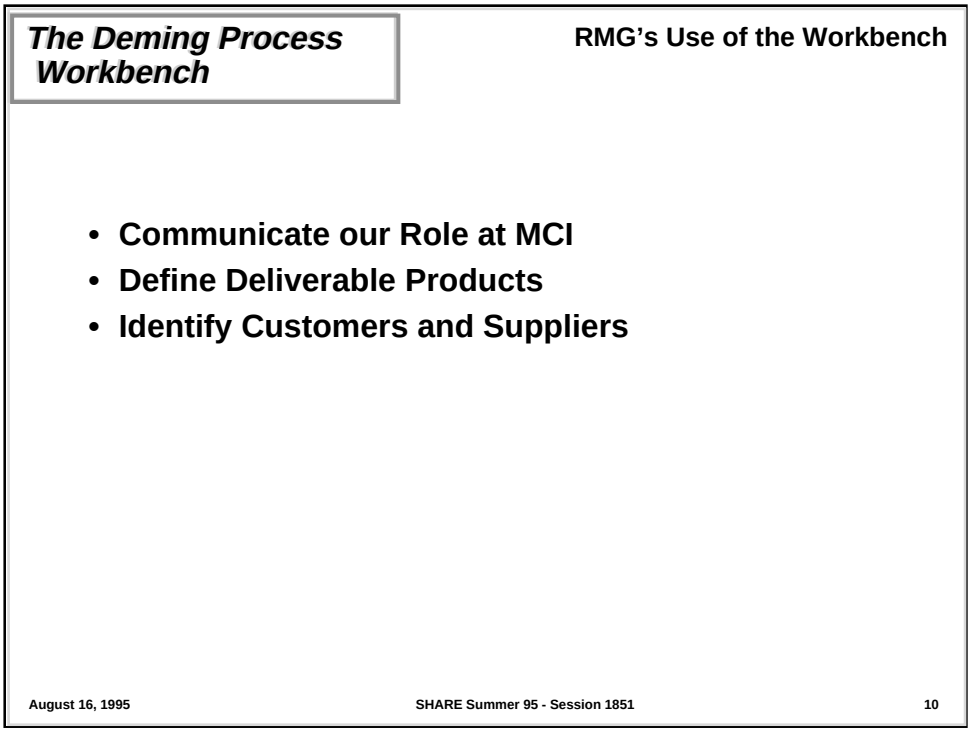

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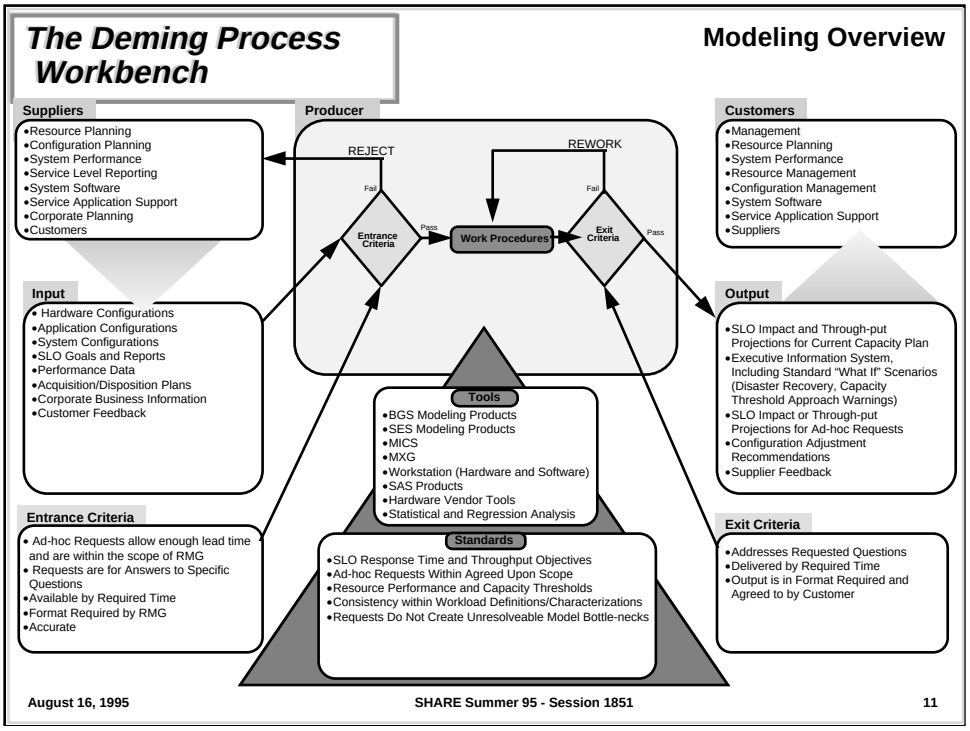

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- **Entrance Criteria:** Defines the required quality of the input in measurable terms. The criteria determines if the Input provided for a request will be accepted and processed or rejected and returned.
- **Tools:** The tools and products that RMG will use, and therefore *must* be available, to produce the Output.
- **Standards:** The measurable definition of the Output product.
- **Customers:** View the workbench from the output side. These organizations require and make use of the Outputs provided by RMG.
- **Output:** The data and information provide to the Customer organizations as a result of modeling services.
- **Exit Criteria:** Defines the required quality of the output in measurable terms. The criteria determines if the Output provided for a request will be accepted or rejected by the Customer.
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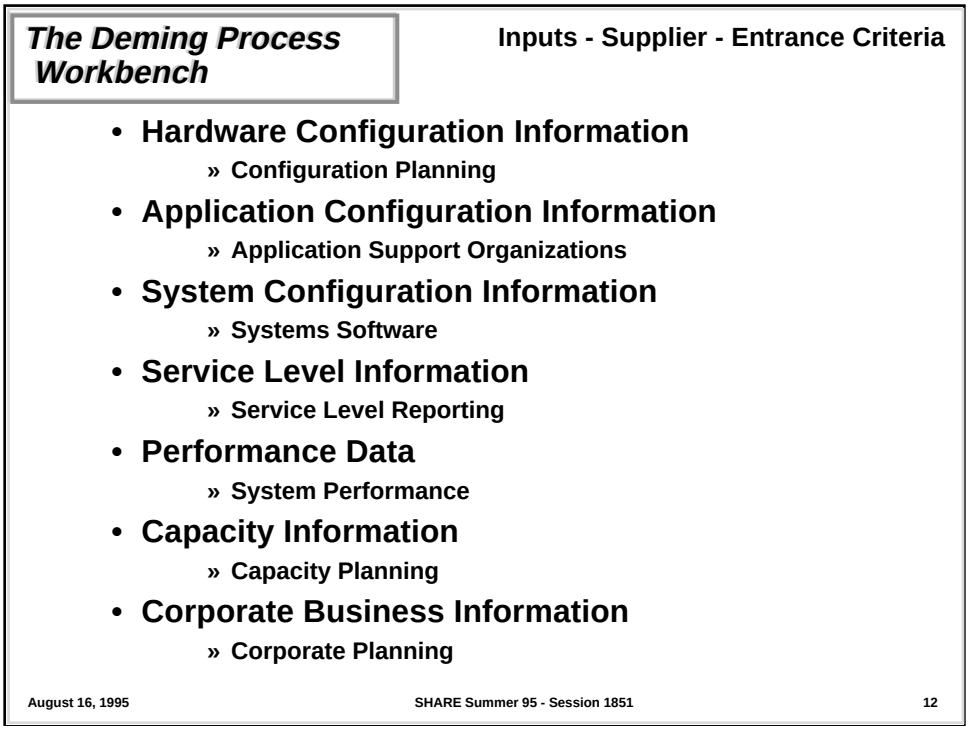
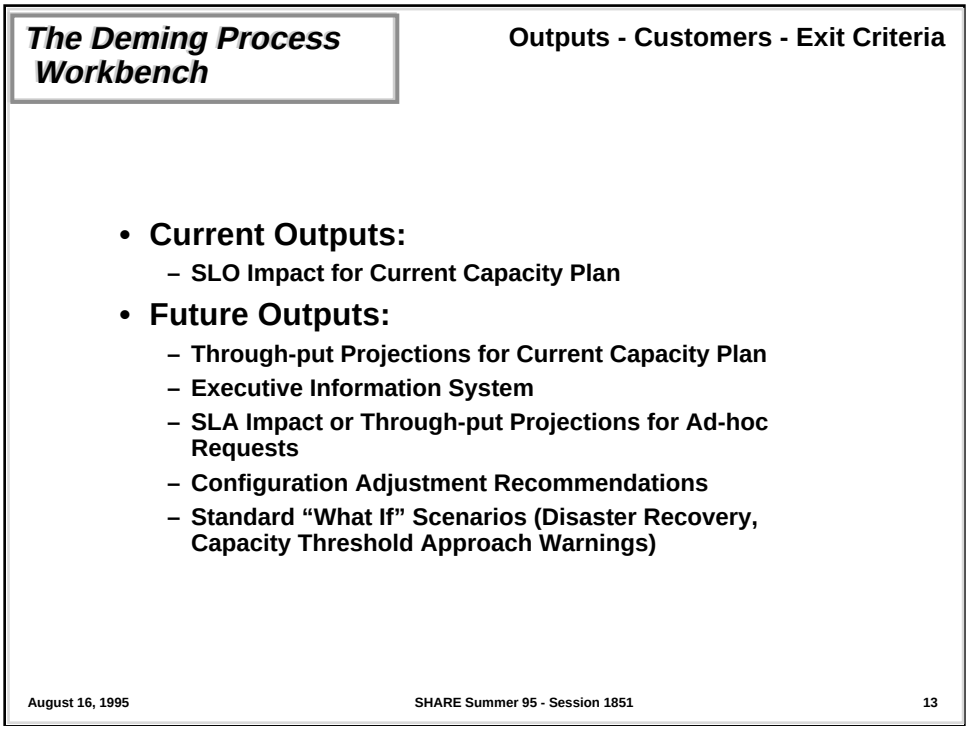
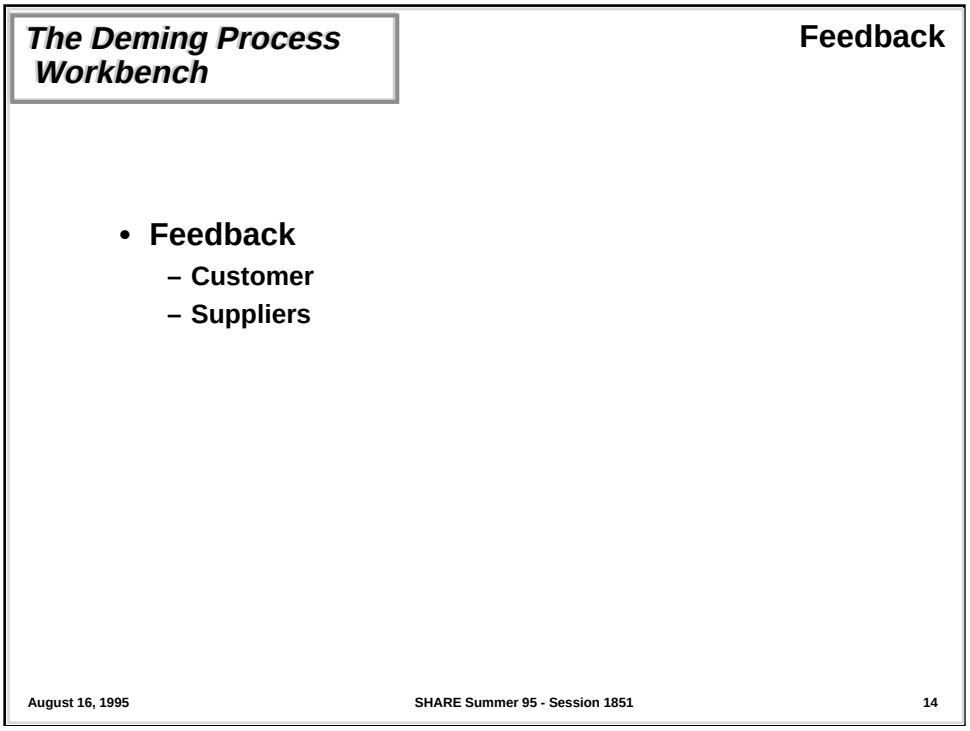


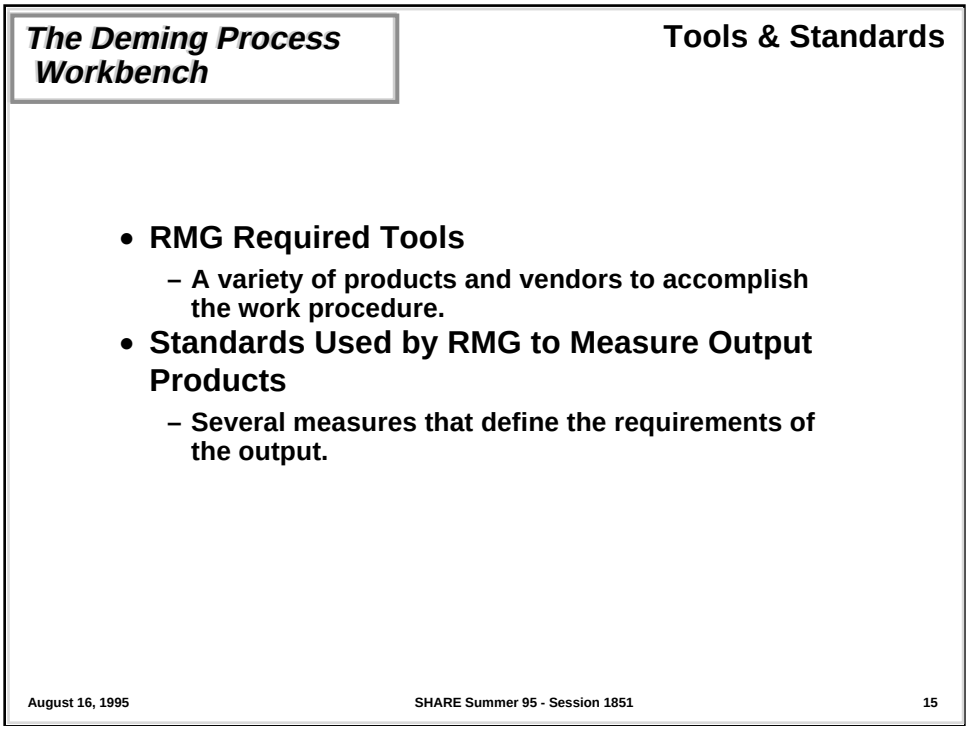
- **Hardware Configuration Information**
  - Detailed information showing all mainframe hardware installed in each data center, in both chart and report format.
- **Application Configuration Information**
  - Information for all mainframe based applications in each data center detailing anything that impacts the ability to meet the application Service Level Objective (SLO) or limit the location where the application will function.
- **Software Configuration Information**
  - Detailed information showing all mainframe software installed in each data center.
- **Service Level Information**
  - Detailed information showing all Service Level information for all mainframe based applications in each data center.
- **Performance Data**
  - Detailed data related to system level performance from a variety of sources and tools.
- **Capacity Information**
  - **Acquisition/Disposition Plans**
  - **Capacity Plan**
- **Corporate Business Information**
  - **Business Drivers:** Databased information containing current, historical and marketing predictions for the major business drivers.



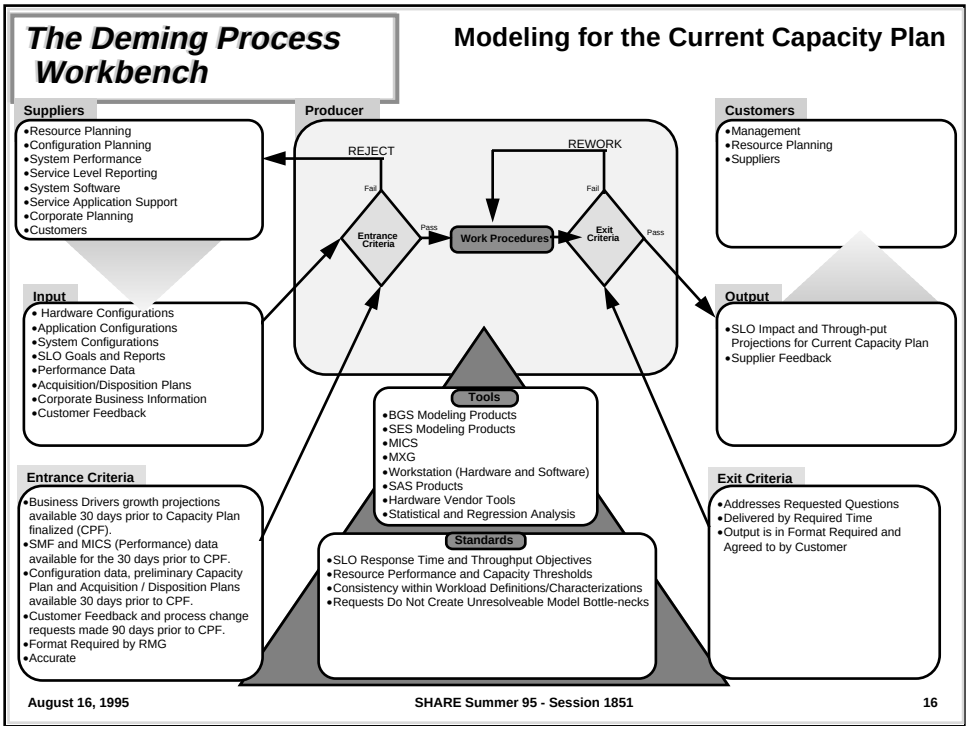
- **Current Outputs:** The following outputs have been agreed upon with the Customers involved and are documented in greater detail:
  - **SLO Impact for Current Capacity Plan:** A set of charts, by LPAR, showing the current and projected service relative to the Service Level Objective (SLO) for each on-line application.
- **Future Outputs:** The following outputs are being proposed to the Customers involved but have not been agreed upon. They will be documented in greater detail at a future date:
  - **Through-put Projections for Current Capacity Plan:** A set of charts, by LPAR, showing the current and projected service relative to the Service Level Objective (SLO) for each batch application.
  - **Executive Information System:** A workstation based graphical presentation system automatically updated and available to any interested manager.
  - **Configuration Adjustment Recommendations:** Each situation will require different output, but in general, it will provide the organization(s) interested in the appropriate area with the information needed to evaluate and implement the recommendation.
  - **SLO Impact or Through-put Projections for Ad-hoc Requests**
  - **Standard "What If" Scenarios (Disaster Recovery, Capacity Threshold Approach Warnings)**



- **Supplier Feedback**
  - **Customer:**
    - **Suppliers:** All Suppliers providing input for any RMG products.
  - **Output:**
    - **Feedback Regarding Products Used by RMG :** Any information about the quality, usability or value of any product used as input to an RMG product. Any changes in the RMG process should be reflected in feedback requests to modify the products used by RMG, including the product itself or the entrance criteria.
- **Customer Feedback**
  - **Supplier:**
    - **Customers:** All customers using any RMG products.
  - **Input:**
    - **Feedback Regarding the RMG Products:** Any information about the quality, usability or value of any RMG product. Any changes in the customers requirements or schedule should be reflected in feedback requests to modify the RMG product, the process or the exit criteria.

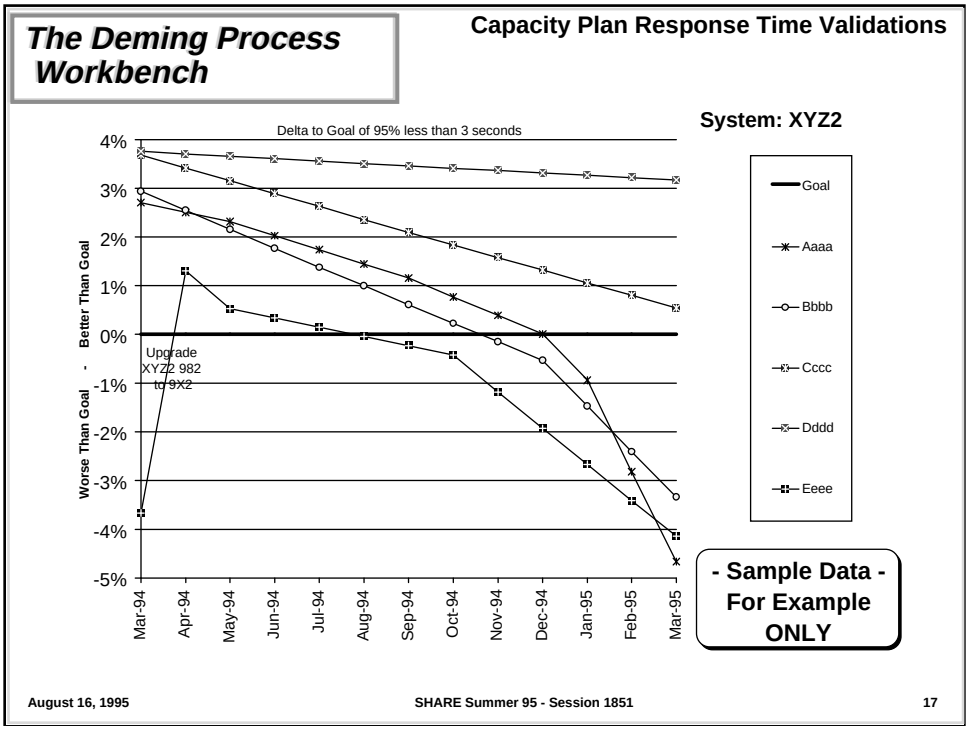


- **RMG Required Tools:** The tools and products that RMG will use, and therefore must be available, to produce the Output:
  - BGS Modeling Products
  - SES Modeling Products
  - MICS
  - MXG
  - Workstation (Hardware and Software)
  - SAS Products
  - Hardware Vendor Tools
  - Statistical and Regression Analysis
- **Standards Used by RMG to Measure Output Products:**
  - **Response Time and Throughput Objectives**
    - » What are the company goals and the customers expectations?
  - **Ad-hoc Requests Within Agreed Upon Scope**
    - » For example, printer problems cannot be addressed with a CPU model.
  - **Resource Performance and Capacity Thresholds**
    - » How busy can things get? (Both technically and politically)
  - **Consistency within Workload Definitions/Characterizations**
    - » Does everyone agree about what makes up each workload?
  - **Requests Do Not Create Unresolvable Model Bottle-necks**
    - » A request for CPU sizing may be worthless if the Big-Data-Base volume(s) are 100% busy.



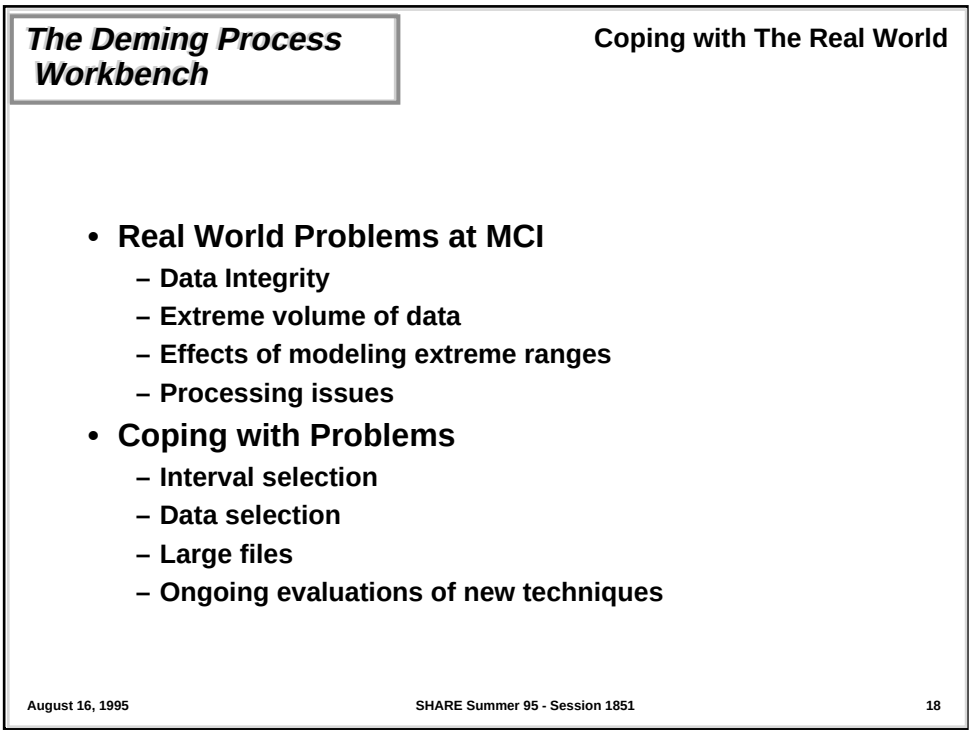
The above Deming Process Workbench Model shows the process for validating the Capacity Plan produced by Resource Planning. Each of the Inputs and the Output were detailed earlier in this documentation.

- **Suppliers:** These organizations provide RMG with information that impacts the Capacity Plan either from a capacity viewpoint, from a workload viewpoint or from a system control viewpoint.
- **Input:** Inputs include those required to produce a model of each LPAR. The inputs also include a preliminary version of the Capacity Plan to be validated.
- **Entrance Criteria:** The Inputs are required enough prior to the date the Capacity Plan is finalized (CPF) to allow RMG to produce a twelve month model of each LPAR. The preliminary Capacity Plan delivered to RMG 30 days prior to CPF is the plan that will be finalized. Any changes to the Capacity Plan after it is delivered to RMG *will not* be reflected in the Output delivered to Resource Planning.
- **Tools:** The tools and products that RMG will use, and therefore *must* be available, to produce the Output.
- **Standards:** The measurable definition of the Output product.
- **Customers:** Resource Planning.
- **Output: Impact Charts:** A set of charts, by LPAR, showing the level of impact to the Service Level Agreements (SLA) by major application. Each chart will show the current and projected service relative to the Service Level Objective (SLO) for each application.
- **Exit Criteria:** The Impact Charts must be delivered to Resource Planning five days prior to CPF. Failure of the Impact Charts to show SLO compliance for any LPAR *DOES NOT* constitute failure of RMG to validate the Capacity Plan. New or revised Capacity Plans can be validated, but as new requests, which must meet the Entrance Criteria.
- **Producer:** The Resource Modeling Group (RMG).



Capacity Plan Response Time Model Validations - System Level

- The above chart is an extreme example showing the on-line internal response times for several applications running on one system.
- In this example, using the goal of 95% of the transactions less than 3 seconds, Eeee shows a sharp improvements in the projected response times when the system is upgraded. The other applications don't show improvement because they are not CPU constrained. ***NOTE:*** *This analysis is for example only and does* ***NOT*** *reflect reality at MCI.*



• Real World Problems at MCI

- Data Integrity can be impacted by missing data or by errors in the data or the process. These can be attributed to operator errors, hardware errors and/or management decisions.
- Extreme volume of data in large on-line environments can cause problems processing the data; both obtaining sufficient DASD space and managing very long running jobs.
- Effects of modeling extreme ranges can produce unreliable results.
- Processing issues due to run time variations inhibit rapid response to ad-hoc requests.

• Coping with Problems

- Interval selection by doing a careful analysis of the data requirements.
- Data selection needs to be limited to only the data required for the desired analysis to avoid artificial elongation of data reduction times.
- Large files are handled by c*areful* use of “temporary” multi-volume allocations.
- Ongoing evaluations of new techniques; such as hiper-spaces and data-spaces, batch LSR, batch pipes, large buffers or other I/O avoidance techniques; requires reviewing the data collected vs. the data required to reduce the total amount to be processed.

The Deming Process Workbench:
An Application at MCI

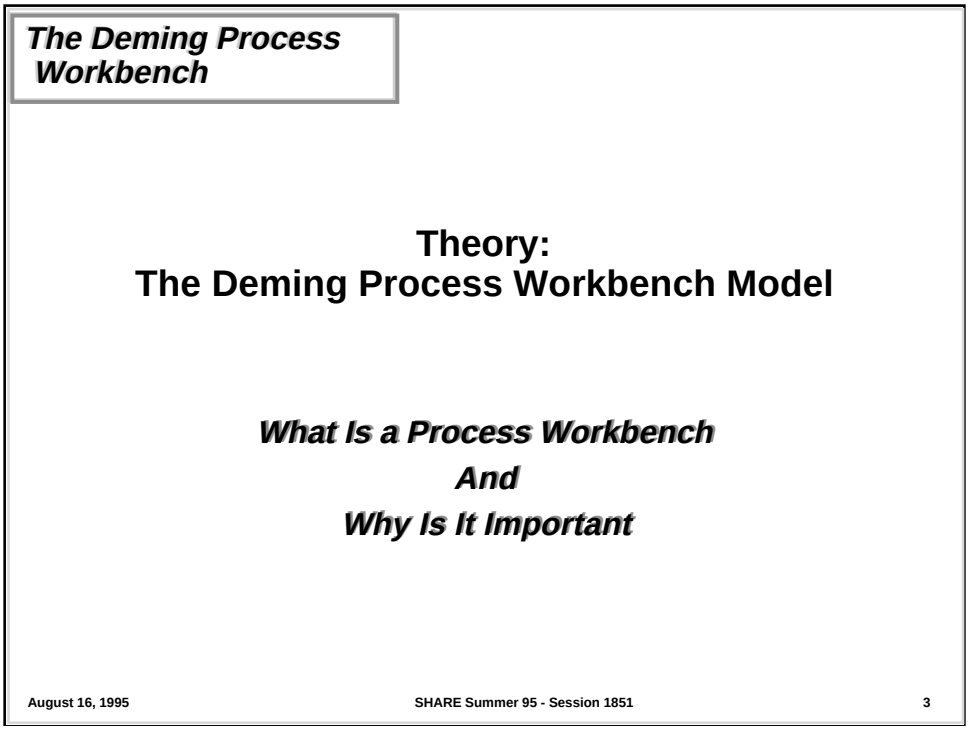
Tim R. Norton
Larry R. Kayser
presented by
Linda Boyd

Resource Modeling Group
Systems Engineering
MCI Telecommunications Corporation
2424 Garden of the Gods Road
Colorado Springs, CO 80919

SHARE Summer 95
Session 1851
August 16, 1995

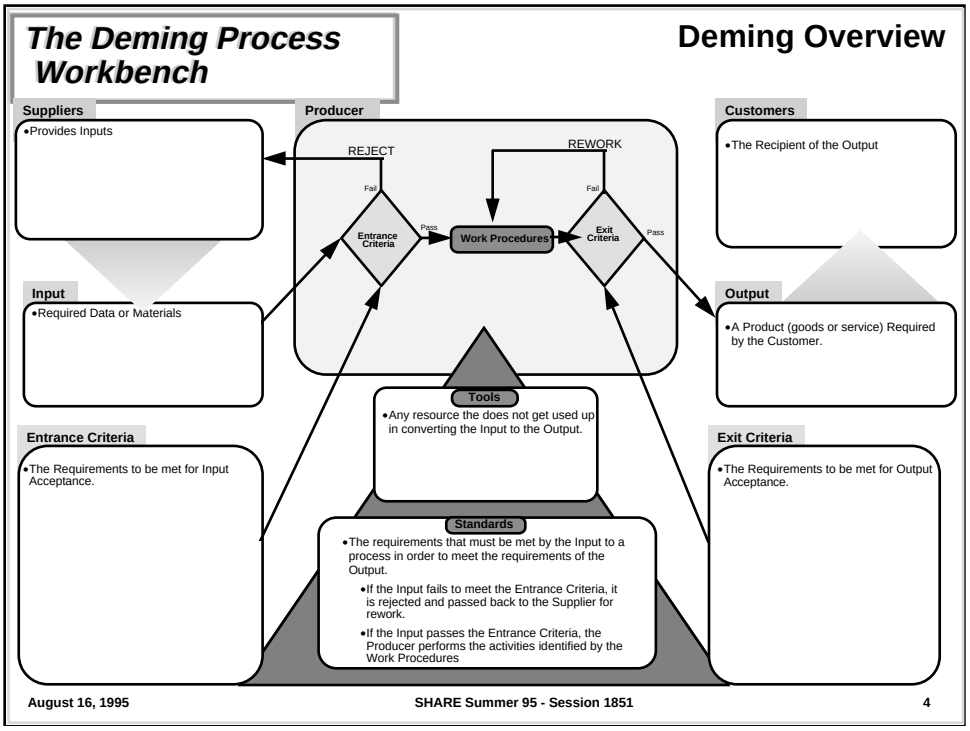
Agenda

- **Theory: The Deming Process Workbench Model**
- **Resource Modeling Group (RMG)**
- **Methodology: The RMG Workbench**
- **An Example - The Capacity Plan**
- **Coping with The Real World**



- **What Is a Process Workbench**
  - A process workbench is a **method** of process identification.
  - It is a **tool** which illustrates the boundaries that define the scope of any given process.
  - It **defines** the process components necessary for the producer to accomplish quality control, measurement and improvement (optimization).
  - It also helps **identify** activities that comprise a process so that analysis can be performed.
- **Why Is It Important -** The benefits of a process workbench include:
  - **Analysis** and **documentation** of new and existing processes
  - Vendor/supplier **requirements** identification
  - A customer requirements **negotiation** vehicle
  - Roles/responsibilities **definition**
  - A **definition** of standards, procedures and measurement/metrics for quality control.
  - It also provides a **'template'** for a common communication platform.

Before a process can be Managed, Measured, or Improved,
It must be identified.



The above Deming Process Workbench Model shows the relationships between The Producer and the other organizations.

- The workbench represents the boundaries or span of control for the process. There are three views: Supplier, Customer and Producer.

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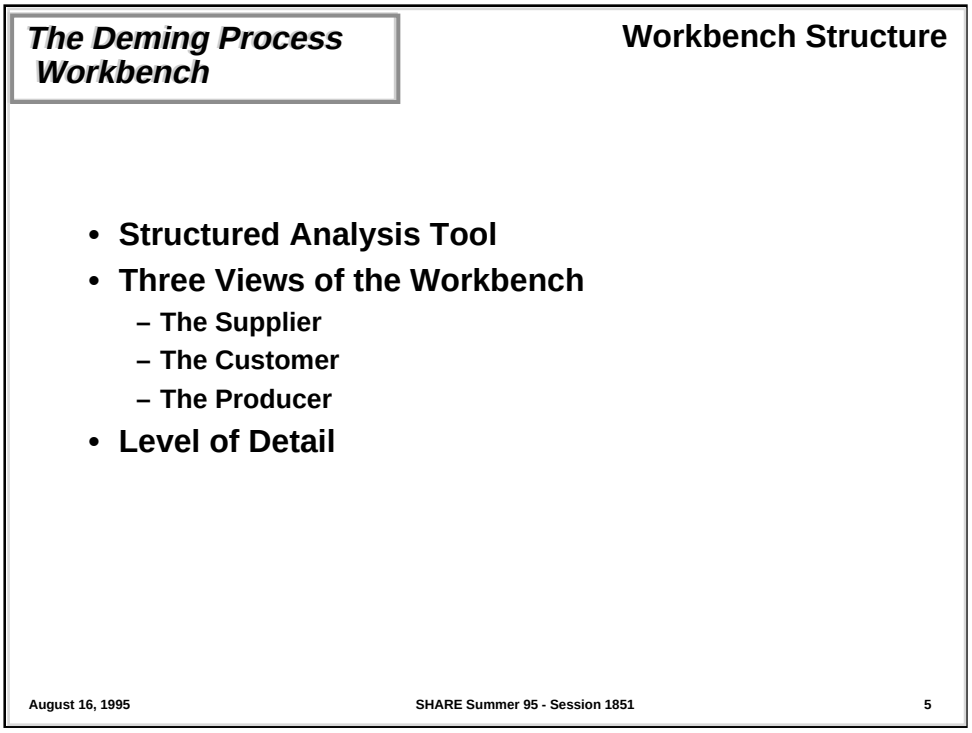

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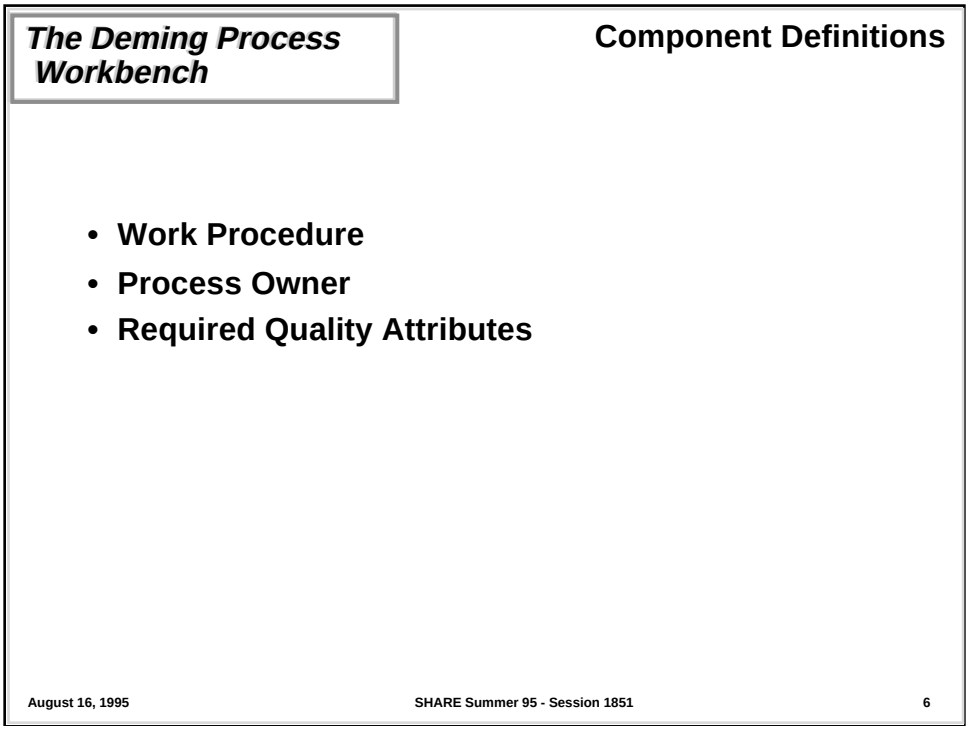

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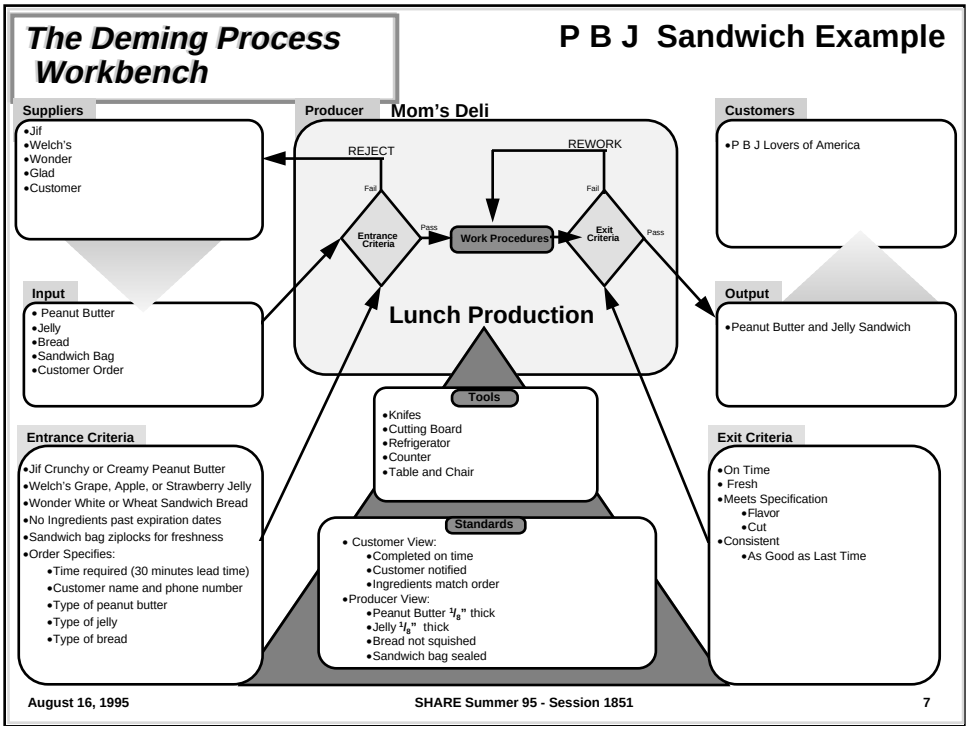

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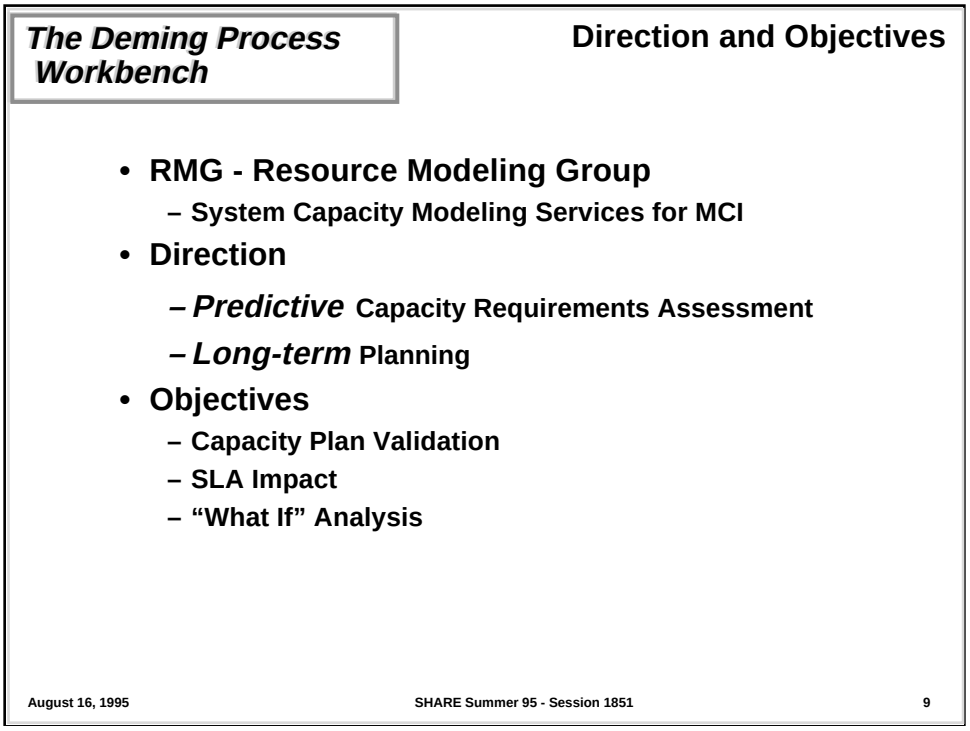

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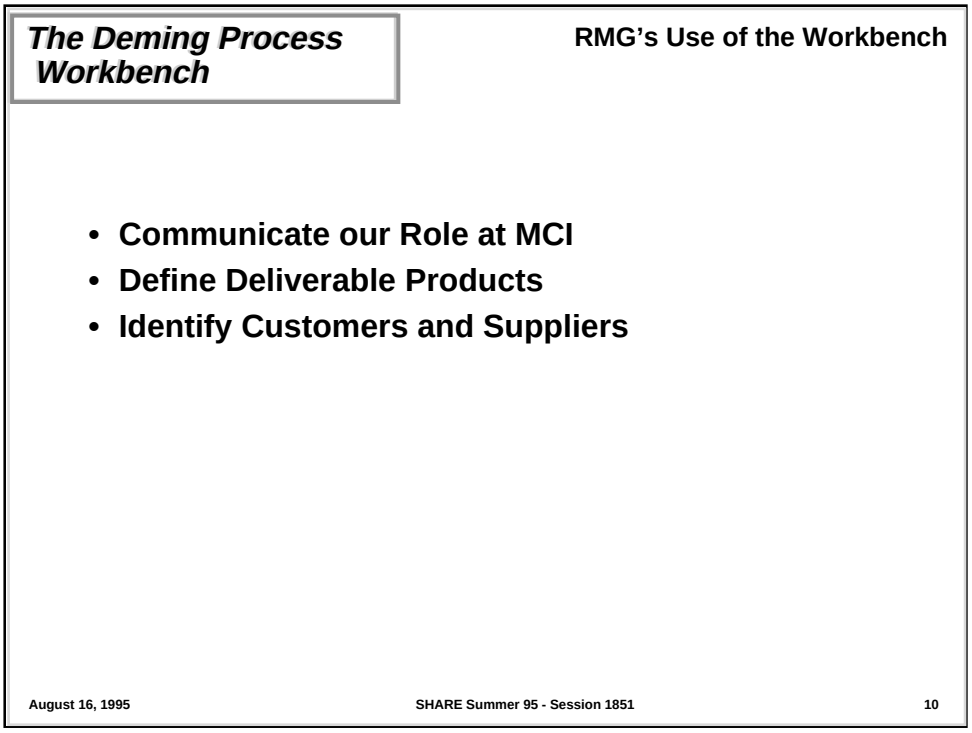

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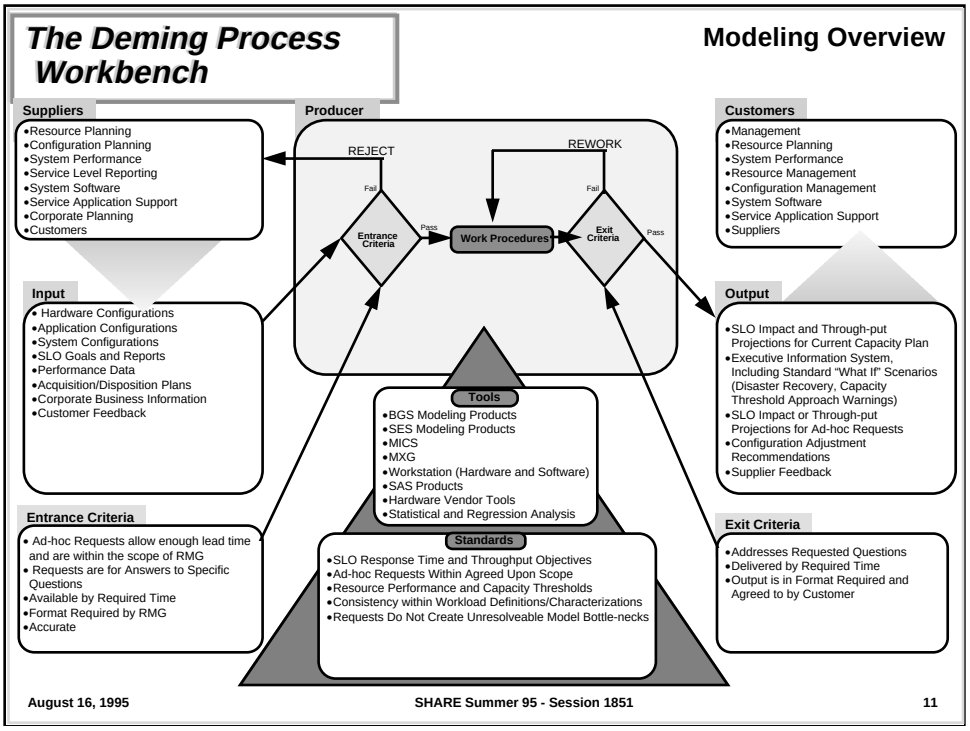

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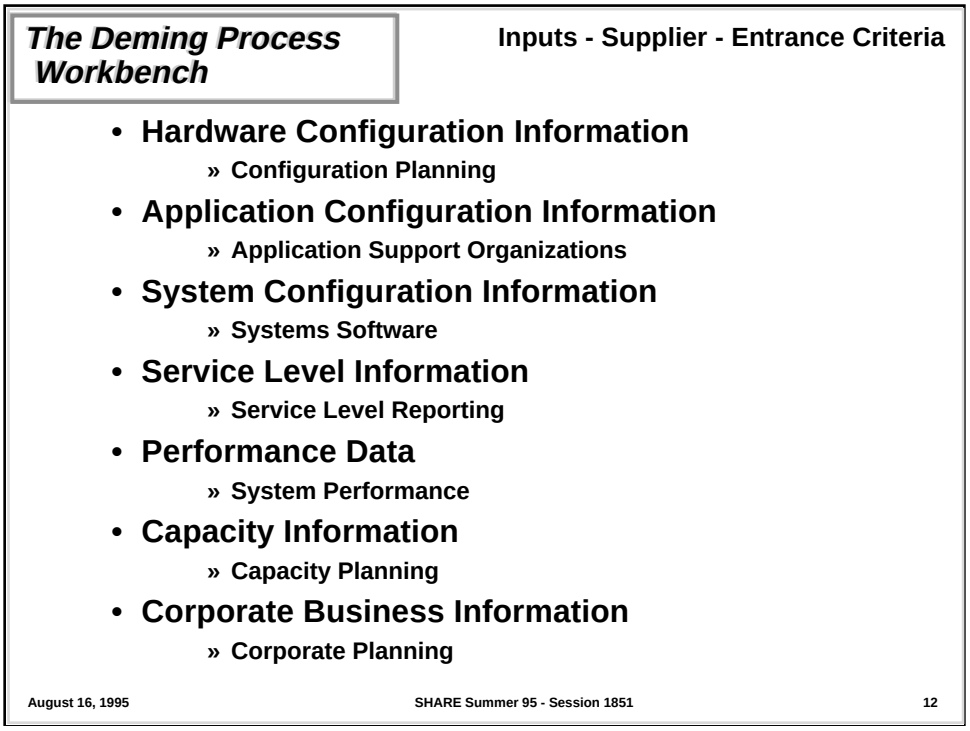
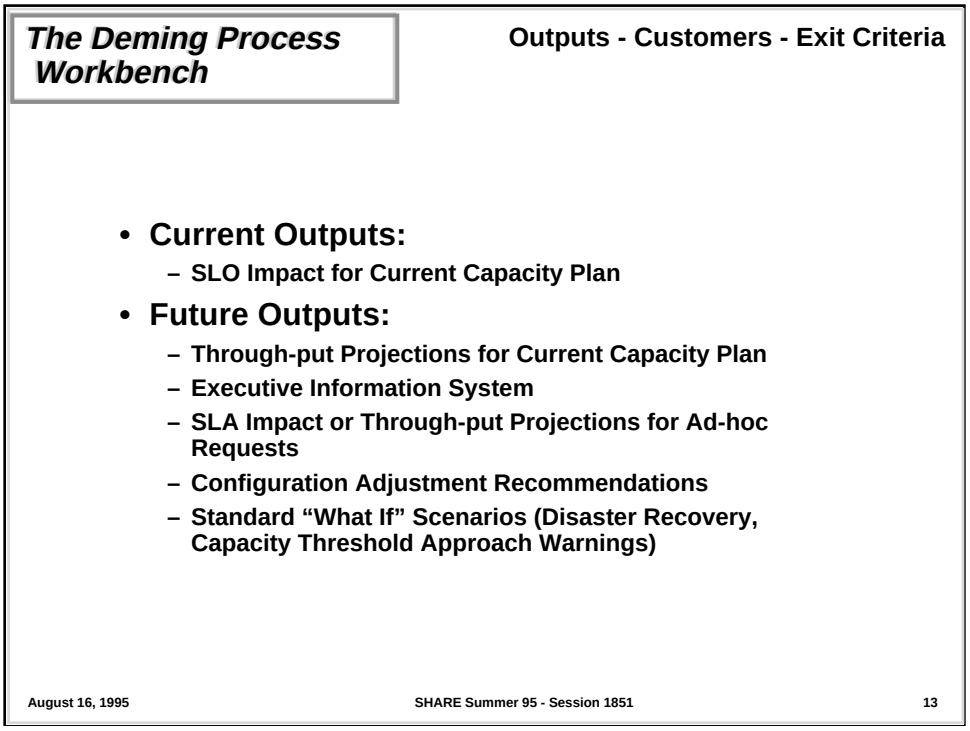
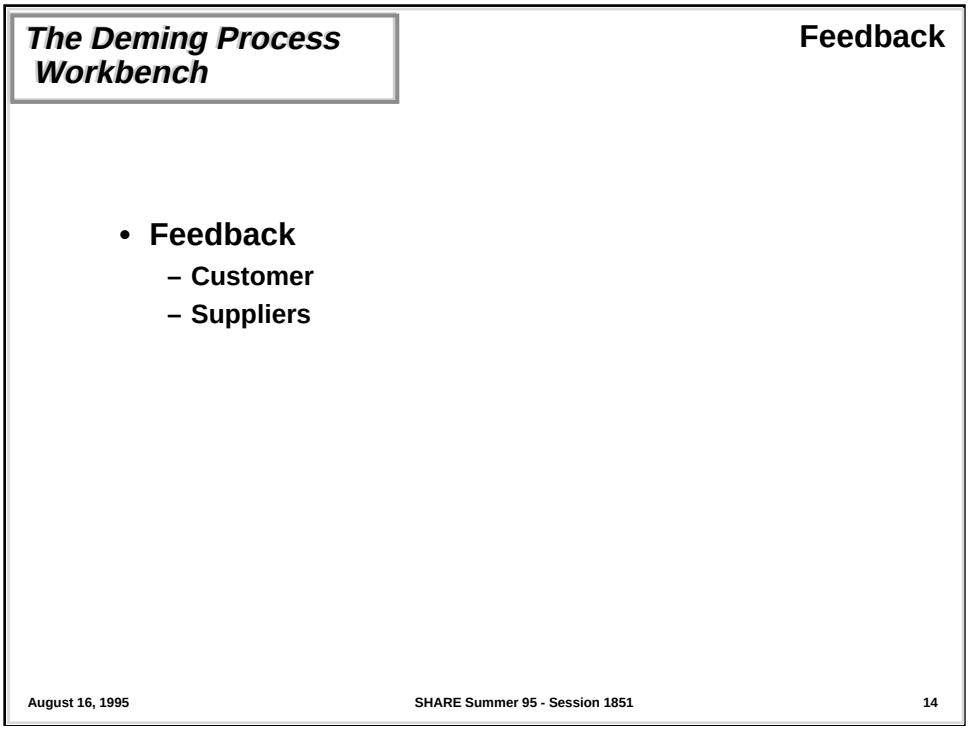
- **Input:** The data and information required from the Suppliers to provide modeling services.
- **Entrance Criteria:** Defines the required quality of the input in measurable terms. The criteria determines if the Input provided for a request will be accepted and processed or rejected and returned.
- **Tools:** The tools and products that RMG will use, and therefore *must* be available, to produce the Output.
- **Standards:** The measurable definition of the Output product.
- **Customers:** View the workbench from the output side. These organizations require and make use of the Outputs provided by RMG.
- **Output:** The data and information provide to the Customer organizations as a result of modeling services.
- **Exit Criteria:** Defines the required quality of the output in measurable terms. The criteria determines if the Output provided for a request will be accepted or rejected by the Customer.
- **Producer:** Views the workbench from the inside and produces the output using the specified tools and standards.



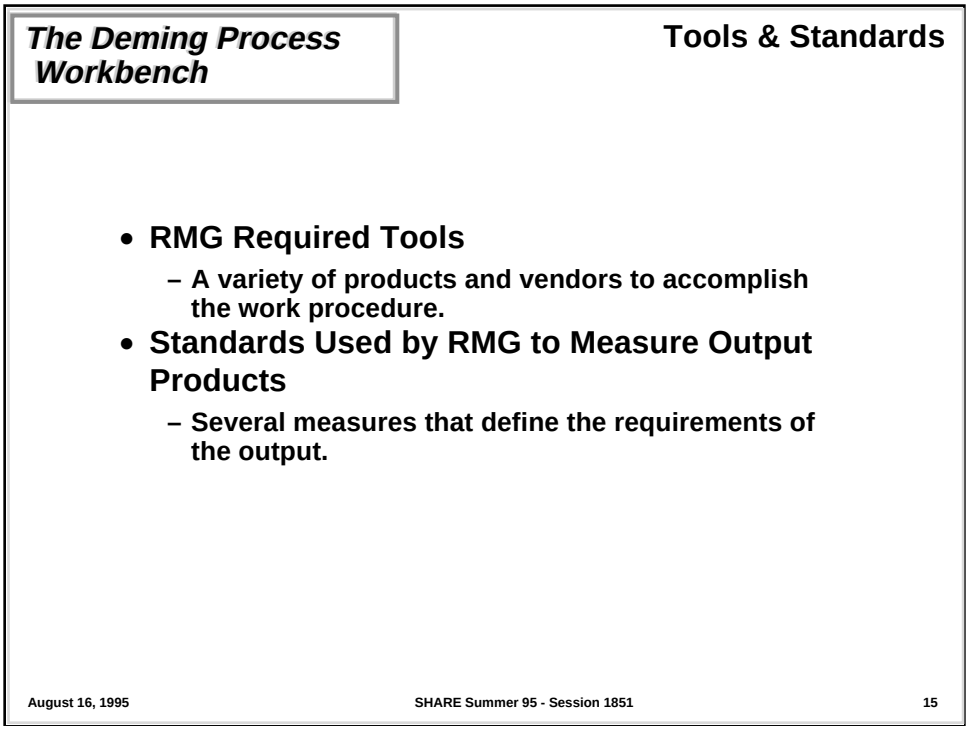
- **Hardware Configuration Information**
  - Detailed information showing all mainframe hardware installed in each data center, in both chart and report format.
- **Application Configuration Information**
  - Information for all mainframe based applications in each data center detailing anything that impacts the ability to meet the application Service Level Objective (SLO) or limit the location where the application will function.
- **Software Configuration Information**
  - Detailed information showing all mainframe software installed in each data center.
- **Service Level Information**
  - Detailed information showing all Service Level information for all mainframe based applications in each data center.
- **Performance Data**
  - Detailed data related to system level performance from a variety of sources and tools.
- **Capacity Information**
  - **Acquisition/Disposition Plans**
  - **Capacity Plan**
- **Corporate Business Information**
  - **Business Drivers:** Databased information containing current, historical and marketing predictions for the major business drivers.



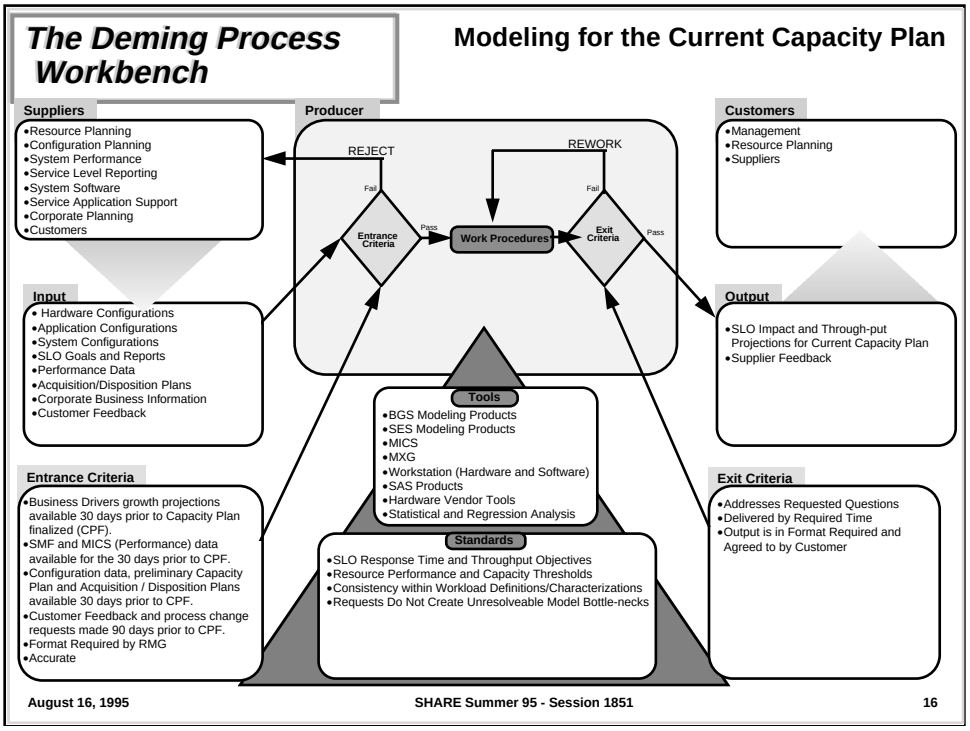
- **Current Outputs:** The following outputs have been agreed upon with the Customers involved and are documented in greater detail:
  - **SLO Impact for Current Capacity Plan:** A set of charts, by LPAR, showing the current and projected service relative to the Service Level Objective (SLO) for each on-line application.
- **Future Outputs:** The following outputs are being proposed to the Customers involved but have not been agreed upon. They will be documented in greater detail at a future date:
  - **Through-put Projections for Current Capacity Plan:** A set of charts, by LPAR, showing the current and projected service relative to the Service Level Objective (SLO) for each batch application.
  - **Executive Information System:** A workstation based graphical presentation system automatically updated and available to any interested manager.
  - **Configuration Adjustment Recommendations:** Each situation will require different output, but in general, it will provide the organization(s) interested in the appropriate area with the information needed to evaluate and implement the recommendation.
  - **SLO Impact or Through-put Projections for Ad-hoc Requests**
  - **Standard "What If" Scenarios (Disaster Recovery, Capacity Threshold Approach Warnings)**



- **Supplier Feedback**
  - **Customer:**
    - **Suppliers:** All Suppliers providing input for any RMG products.
  - **Output:**
    - **Feedback Regarding Products Used by RMG :** Any information about the quality, usability or value of any product used as input to an RMG product. Any changes in the RMG process should be reflected in feedback requests to modify the products used by RMG, including the product itself or the entrance criteria.
- **Customer Feedback**
  - **Supplier:**
    - **Customers:** All customers using any RMG products.
  - **Input:**
    - **Feedback Regarding the RMG Products:** Any information about the quality, usability or value of any RMG product. Any changes in the customers requirements or schedule should be reflected in feedback requests to modify the RMG product, the process or the exit criteria.

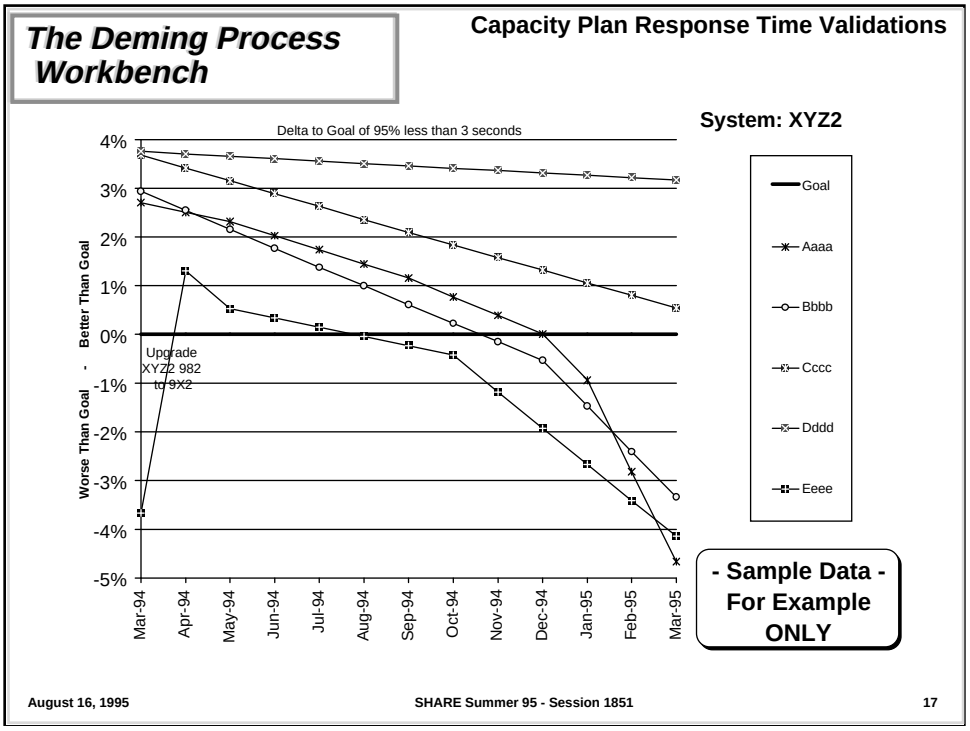


- **RMG Required Tools:** The tools and products that RMG will use, and therefore must be available, to produce the Output:
  - BGS Modeling Products
  - SES Modeling Products
  - MICS
  - MXG
  - Workstation (Hardware and Software)
  - SAS Products
  - Hardware Vendor Tools
  - Statistical and Regression Analysis
- **Standards Used by RMG to Measure Output Products:**
  - **Response Time and Throughput Objectives**
    - » What are the company goals and the customers expectations?
  - **Ad-hoc Requests Within Agreed Upon Scope**
    - » For example, printer problems cannot be addressed with a CPU model.
  - **Resource Performance and Capacity Thresholds**
    - » How busy can things get? (Both technically and politically)
  - **Consistency within Workload Definitions/Characterizations**
    - » Does everyone agree about what makes up each workload?
  - **Requests Do Not Create Unresolvable Model Bottle-necks**
    - » A request for CPU sizing may be worthless if the Big-Data-Base volume(s) are 100% busy.



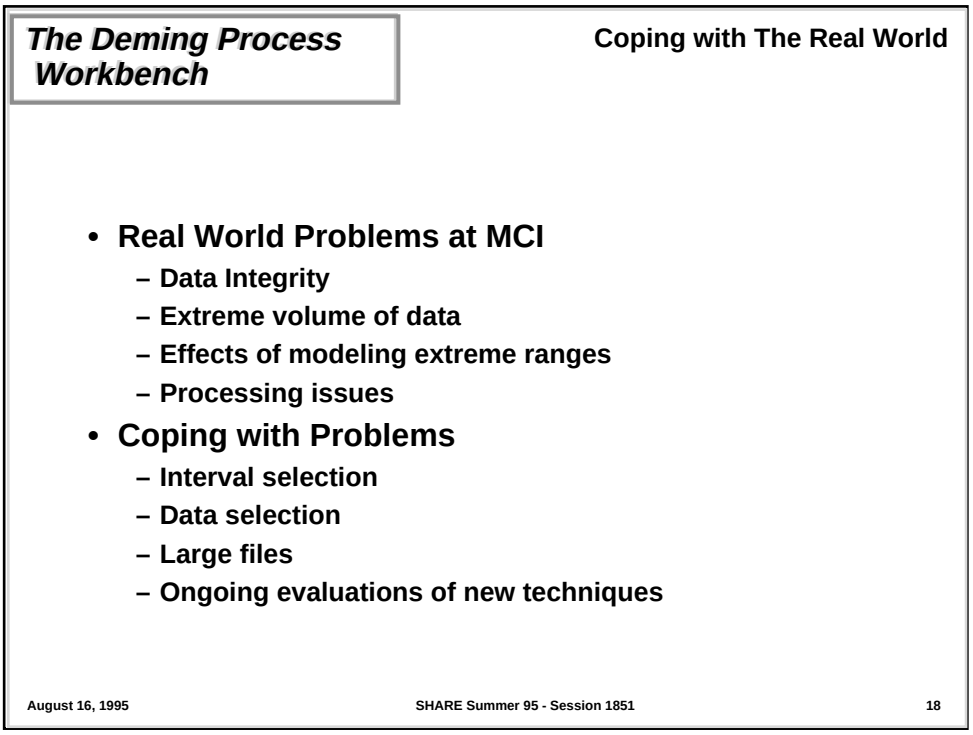
The above Deming Process Workbench Model shows the process for validating the Capacity Plan produced by Resource Planning. Each of the Inputs and the Output were detailed earlier in this documentation.

- **Suppliers:** These organizations provide RMG with information that impacts the Capacity Plan either from a capacity viewpoint, from a workload viewpoint or from a system control viewpoint.
- **Input:** Inputs include those required to produce a model of each LPAR. The inputs also include a preliminary version of the Capacity Plan to be validated.
- **Entrance Criteria:** The Inputs are required enough prior to the date the Capacity Plan is finalized (CPF) to allow RMG to produce a twelve month model of each LPAR. The preliminary Capacity Plan delivered to RMG 30 days prior to CPF is the plan that will be finalized. Any changes to the Capacity Plan after it is delivered to RMG *will not* be reflected in the Output delivered to Resource Planning.
- **Tools:** The tools and products that RMG will use, and therefore *must* be available, to produce the Output.
- **Standards:** The measurable definition of the Output product.
- **Customers:** Resource Planning.
- **Output: Impact Charts:** A set of charts, by LPAR, showing the level of impact to the Service Level Agreements (SLA) by major application. Each chart will show the current and projected service relative to the Service Level Objective (SLO) for each application.
- **Exit Criteria:** The Impact Charts must be delivered to Resource Planning five days prior to CPF. Failure of the Impact Charts to show SLO compliance for any LPAR *DOES NOT* constitute failure of RMG to validate the Capacity Plan. New or revised Capacity Plans can be validated, but as new requests, which must meet the Entrance Criteria.
- **Producer:** The Resource Modeling Group (RMG).



Capacity Plan Response Time Model Validations - System Level

- The above chart is an extreme example showing the on-line internal response times for several applications running on one system.
- In this example, using the goal of 95% of the transactions less than 3 seconds, Eeee shows a sharp improvements in the projected response times when the system is upgraded. The other applications don't show improvement because they are not CPU constrained. ***NOTE:*** *This analysis is for example only and does* ***NOT*** *reflect reality at MCI.*



• Real World Problems at MCI

- Data Integrity can be impacted by missing data or by errors in the data or the process. These can be attributed to operator errors, hardware errors and/or management decisions.
- Extreme volume of data in large on-line environments can cause problems processing the data; both obtaining sufficient DASD space and managing very long running jobs.
- Effects of modeling extreme ranges can produce unreliable results.
- Processing issues due to run time variations inhibit rapid response to ad-hoc requests.

• Coping with Problems

- Interval selection by doing a careful analysis of the data requirements.
- Data selection needs to be limited to only the data required for the desired analysis to avoid artificial elongation of data reduction times.
- Large files are handled by c*areful* use of “temporary” multi-volume allocations.
- Ongoing evaluations of new techniques; such as hiper-spaces and data-spaces, batch LSR, batch pipes, large buffers or other I/O avoidance techniques; requires reviewing the data collected vs. the data required to reduce the total amount to be processed.