

A Six Sigma Approach To TCEng Upgrade

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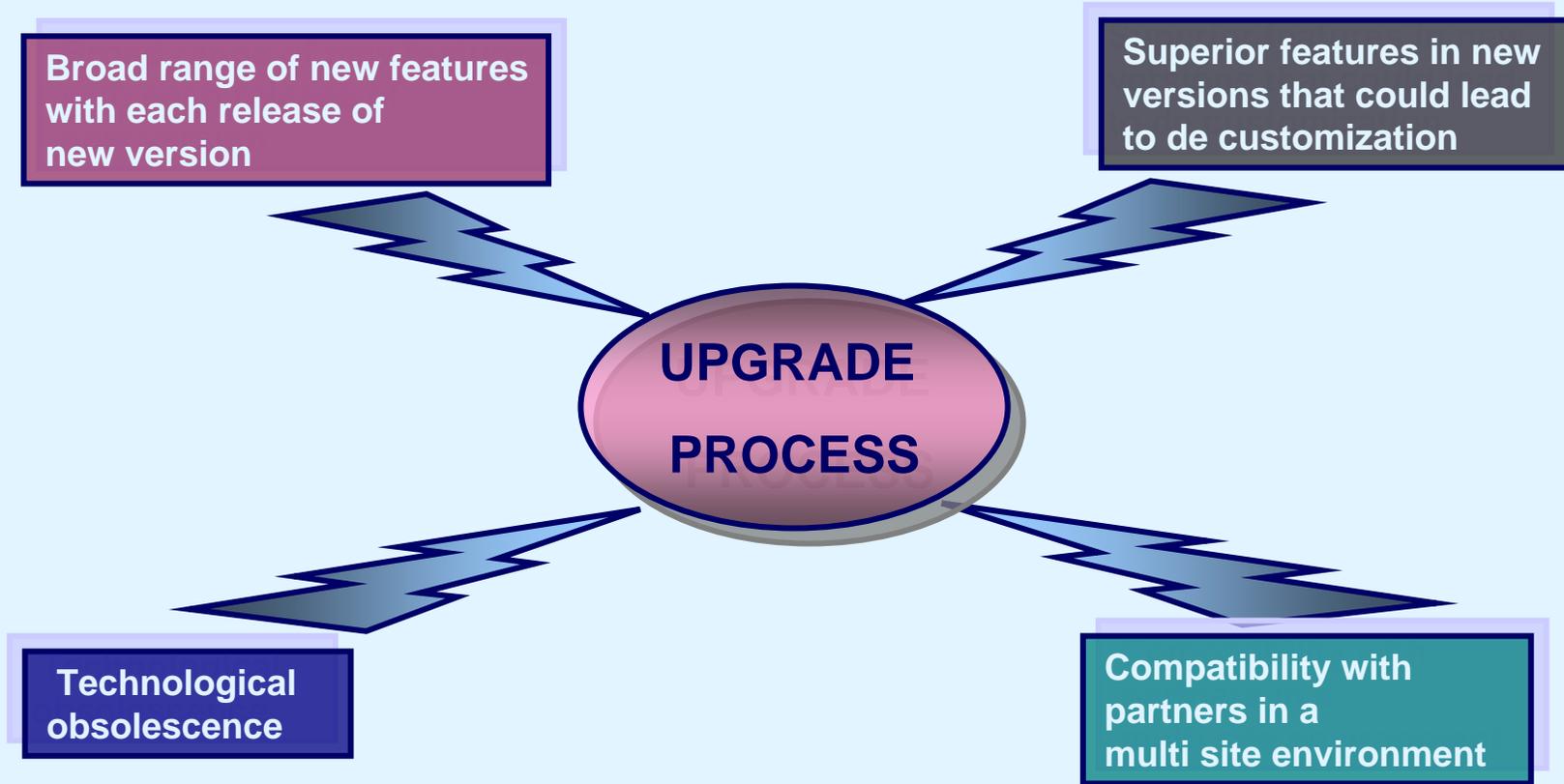
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Presentation Content

- **Why Upgrade?**
- **Why adopt a six sigma approach?**
- **What is Six Sigma?**
- **Essential Steps in Six Sigma Approach**
- **Process Steps In Upgrade – DMADV methodology**
 - **Business Case - Define**
 - **Critical To Quality (CTQ) - Define**
 - **Existing System Setup – Measure**
 - **Pilot Upgrade - Measure**
 - **Cause and Effect - Analyze**
 - **Failure Mode Effect Analysis (FMEA) - Analyze**
 - **Upgrade And Rollback Process - Design**
 - **Pilot Upgrade - Verify**

Why Upgrade TCEng? – Triggers Influencing Upgrade

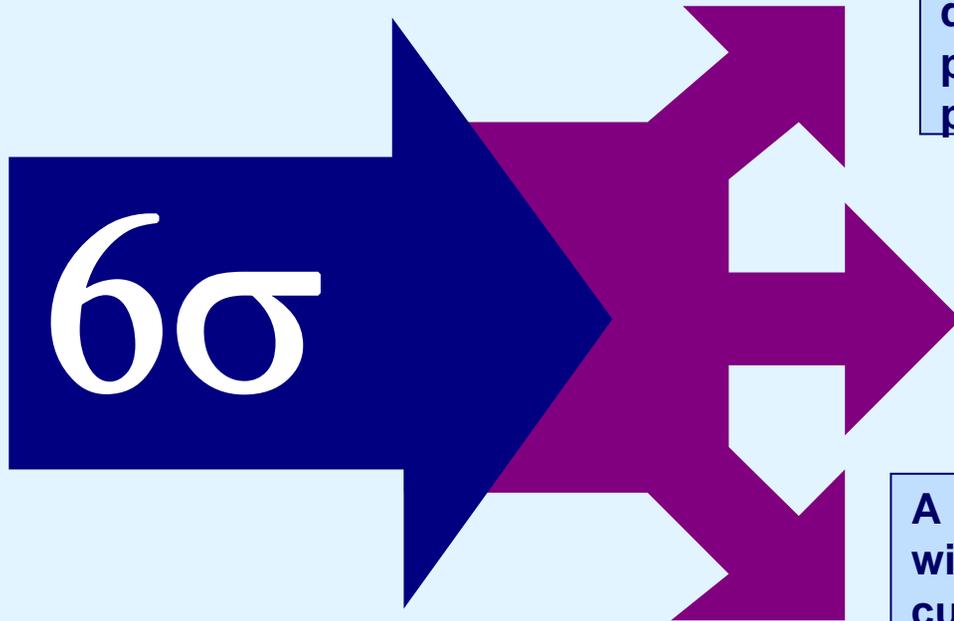


Why adopt a six sigma approach for TCEng Upgrade?

- ❑ Systematic approach to problem solving involving a structured thought process
- ❑ Provides a host of analysis techniques / tools to detect root causes for issues
- ❑ Reduces the opportunity for errors in process
- ❑ Provides tools and techniques for decision making

Six Sigma changes not WHAT we do, but the WAY we do it

What is Six Sigma?



A metric that demonstrates quality levels at 99.99967% performance for products and processes

Metric

A practical application of statistical tools to help measure, analyze, improve, and control the processes

Tool

A rigor to define/improve processes within the organization with focus on customer

Rigor

- A systematic, customer focused, process-driven and metric based approach
- Strives for near perfection in Processes, Products and Services
- Statistical Definition – 3.4 Defects Per Million Opportunities (DPMO)

Six Sigma Reduces Variation In process

Six Sigma Methodologies

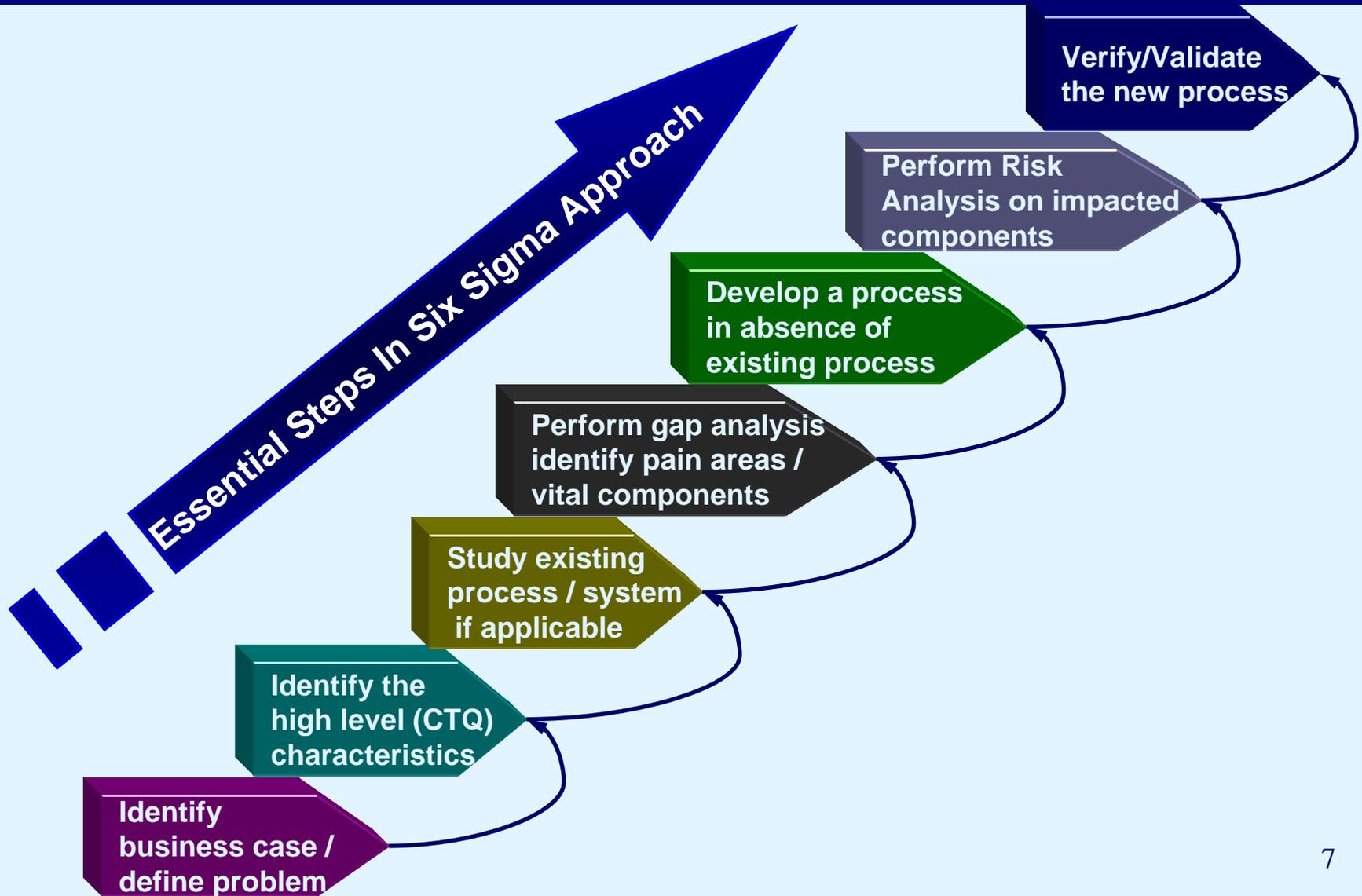
→ DMAIC (Define, Measure, Analyze, Improve, Control)

- ⊕ Applied for existing processes falling below specification and looking for incremental improvement

→ DMADV (Define, Measure, Analyze, Design, Verify)

- ⊕ Applied to develop new processes or products at Six Sigma quality levels

Essential Steps In A Six Sigma Approach



Mapping Process Steps – DMADV Approach

Define

Measure

Analyze

Design

Verify

- Identify Business Case / problems

- Define Scope

- Identify CTQs

- Perform existing system study

- Measure defects in upgrade without any process in place

- Identify impacted components / pain areas

- Develop the new process for upgrade

- Perform FMEA and calculate RPN for each process step in upgrade

- Document and validate the process with a pilot with metrics

Business Case – Define

- Lack of site specific information on existing setup and upgrade**
- Absence of information pertaining to special operating environment (E.g. Cluster mode for DB)**
- Ignoring pre-requisites to be completed prior to upgrade**
- Oversight in performing pre and post upgrade activities**
- Inability in detecting issues at a early stage of upgrade**
- Lack of documents / tools for risk assessment and impact**
- Vital components highly impacting the upgrade not identified**

High Level CTQ's - Define

Design an upgrade process pertaining to TCEng that

- Results in minimal disruption to the existing system**
- Facilitates a smooth rollback in case of any failure**
- Reduce the outage window available for upgrade**
- Incident free upgrade without affecting the end user community**

Upgrade Scope - Define

Scope In :

- Database upgrade pertaining to Oracle
- Cluster Environment For Oracle DB
- Pre and Post install activities for TCEng and Oracle

Scope Out :

- Customizations, Library Merge
- Non-Oracle database upgrade
- IRM upgrade
- TCEng Web Upgrade
- Upgrading MSC environment
- NX Manager Upgrade

Existing System Setup Study - Measure

Oracle

- Operating Environment
 - Hardware Requirements
 - Failover Mechanism
 - OS Patch and Oracle Version
- Backup Procedure
- Kernel Parameters
- Database size
- Version Comparison

TC Engineering

- Backup Mechanism
- Hardware Requirements
- Volume Server Sizing
- Application Architecture
- Operating environment
- OS For Client and Server

Pilot Upgrade - Measure

☹ Oracle Errors

- X System Kernel Parameter definition
- X Cluster environment
- X Oracle backup and import
- X Database Sizing

☹ TCEng Errors

- X Pre installation errors – convert forms not executed resulting in loss of data
- X Database configuration – Performed in windows instead of Unix resulting in improper schema

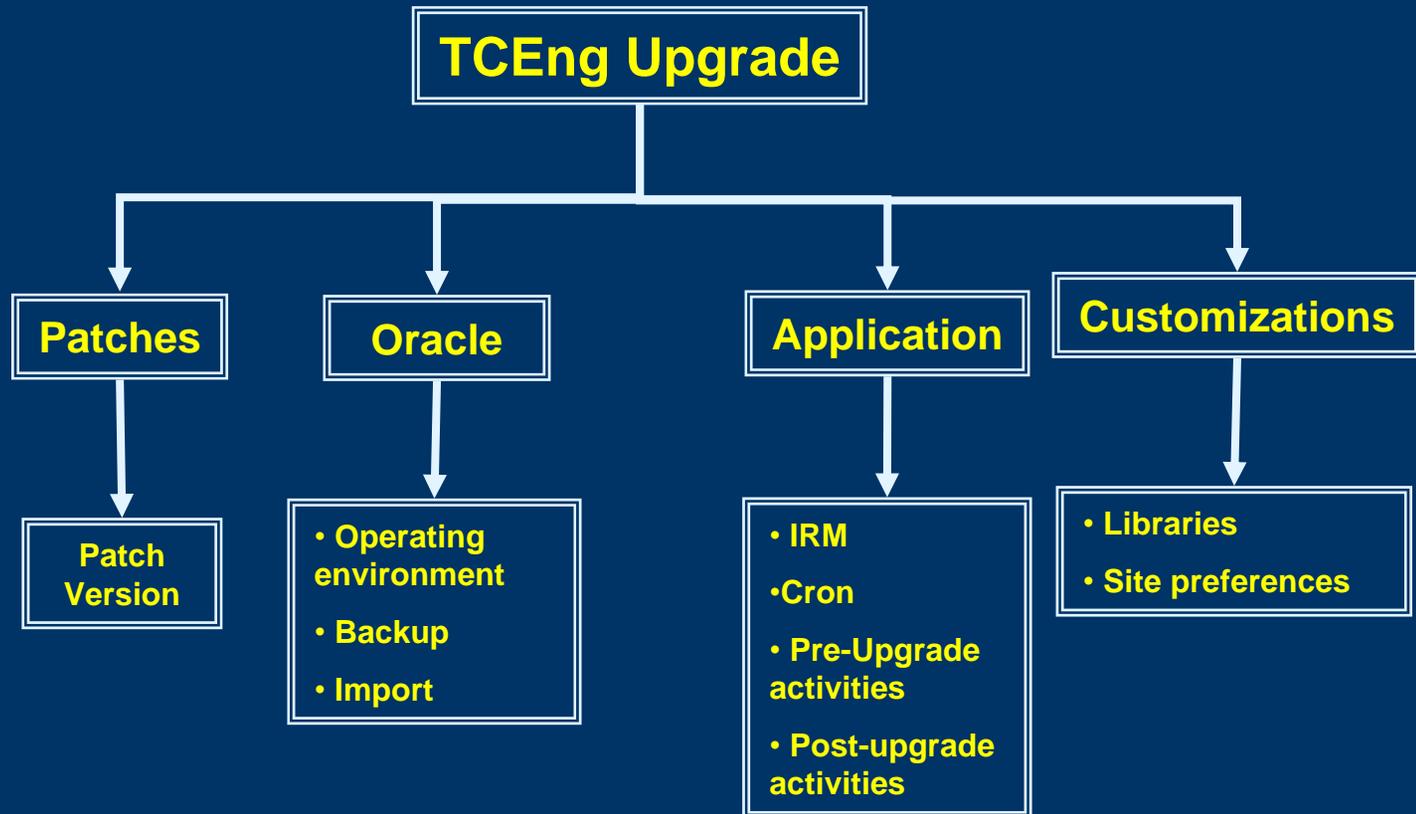
☹ Outage window was very high – 2 days

☹ Time taken for upgrade was 9 days

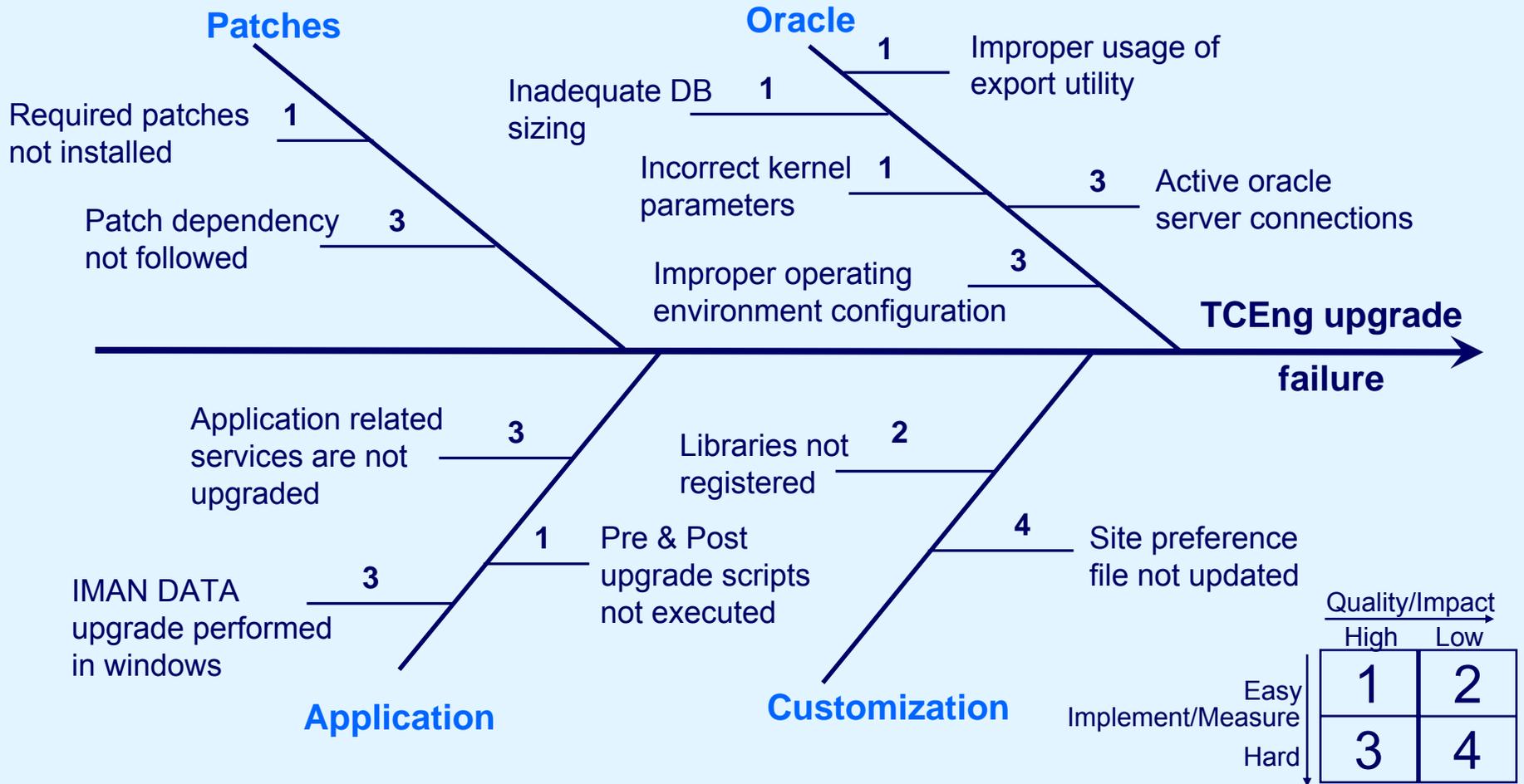
☹ Rollback had to be done due to errors in upgrade

Any Upgrade (Scope In) involving more than 4 days effort is a defect

Impacted Components In Upgrade - Analyze



Cause & Effect Diagram (Fish bone) - Analyze



Operating environment, Oracle backup, Patch Versions are vital components that contribute to a major chunk of the problems during upgrade if not done properly

FMEA For Impacted Components - Analyze

What Can go wrong? (Failure Mode)	Effects	Causes	Current Control	Recommendation
Corrupt Oracle Data / Dump	<ul style="list-style-type: none"> ▪ Results in loss of data ▪ Results in corrupted dump ▪ Backup dump not in sync with live data 	<ul style="list-style-type: none"> ▪ Improper usage of export utility ▪ Lack of disk space when exporting ▪ Active connections with the Oracle server still exist 	None	<ul style="list-style-type: none"> ✓ Experienced Oracle DBA should take the backup ✓ Simulate the database population by importing the backup into a test database ✓ Ensure no active connections exist by shutting down the listener service for the database
OS Related problems	Upgrade failure	<ul style="list-style-type: none"> ▪ Required patches not installed ▪ Patch dependency not followed ▪ Patch installation process did not complete successfully 	None	<ul style="list-style-type: none"> ✓ Refer to the deployment document for the list of patches required ✓ Sequential installation of the patches need to be deployed by referring to the OS vendor instructions ✓ Verify the patch installation by using appropriate OS commands (E.g. swlist for HP-UX)

FMEA For Impacted Components - Analyze

What Can go wrong? (Failure Mode)	Effects	Causes	Current Control	Recommendation
Oracle configuration problems in special operating environment (Cluster fail over mode)	Failure in upgrade of the oracle database	<ul style="list-style-type: none">▪ Cluster service is not stopped before the upgrade▪ Oracle Configuration files (tnsnames.ora and listener.ora) not modified before the upgrade▪ Cluster service is stopped but oracle instance is not active on the cluster	None	<ul style="list-style-type: none">✓ Ensure proper stopping of failover mechanism of the cluster by using the appropriate command (hastop -all -force) and check the status (hastatus -sum)✓ Modify the oracle configuration files to point to the cluster member node instead of the cluster dynamic IP address✓ Ensure that oracle instance is up and running by either running hastatus -sum or ps -aef grep ora. Monitor the status by referring to the cluster log files

FMEA For Impacted Components - Analyze

What Can go wrong? (Failure Mode)	Effects	Causes	Current Control	Recommendation
Oracle upgrade failure	<ul style="list-style-type: none"> ▪ Upgrade fails with shared memory realm error ▪ Improper import of data ▪ Unpredictable operation of application 	<ul style="list-style-type: none"> ▪ Incorrect Kernel parameter settings ▪ Inadequate database sizing ▪ Improper Oracle version / patch upgrade 	None	<ul style="list-style-type: none"> ✓ Make sure that the system file has the correct kernel parameters defined and the values are adequate as per the deployment guide (semaphores and shared memory parameters) ✓ Auto extend all important table spaces that will be considered by the system during upgrade (E.g. TEMP, SYSTEM) ✓ Perform the patch upgrade for oracle as per the instructions in the deployment guide
Oracle database fails to function after upgrade	<ul style="list-style-type: none"> ▪ Improper functioning of database ▪ Oracle does not start up properly and points to improper configuration 	<ul style="list-style-type: none"> ▪ Post upgrade scripts not executed ▪ Modification to the cluster and oracle configuration files not done 	None	<ul style="list-style-type: none"> ✓ All post upgrade scripts mentioned in the deployment guide needs to be executed (E.g. catexp.sql) ✓ Ensure that all modifications are done to point to the new oracle home and instance in the oracle configuration files (listener.ora and tnsnames.ora) and also to the cluster configuration files (main.cf)

FMEA For Impacted Components - Analyze

What Can go wrong? (Failure Mode)	Effects	Causes	Current Control	Recommendation
TCEng upgrade fails	<ul style="list-style-type: none"> ▪ Problems with access to data ▪ Improper functioning of application ▪ Error in accessing and executing customizations 	<ul style="list-style-type: none"> ▪ Application related services are not upgraded ▪ TCEng file system service is not running ▪ Post upgrade scripts not executed ▪ Customization libraries not registered / error in registering or recognizing the custom libraries 	None	<ul style="list-style-type: none"> ✓ Ensure proper upgrade of all services pertaining to the applications, especially TCEng File System service ✓ Start the TCEng file system service and verify its availability by running the appropriate OS commands (ps- aef grep imanfs) ✓ Ensure that all required scripts after the upgrade are executed (E.g. upgrade workflow objects for database storage of workflows) ✓ Ensure that libraries are in the correct path pointed to by the environment variable (IMAN_USER_LIB) and they are built with the correct application libraries pointing to the latest version

FMEA For Impacted Components - Analyze

What Can go wrong? (Failure Mode)	Effects	Causes	Current Control	Recommendation
TCEng Upgrade fails	<ul style="list-style-type: none"> Improper application functioning Improper schema update Loss of data in the application 	<ul style="list-style-type: none"> Site preference file not updated IMAN DATA upgrade performed in windows Pre upgrade scripts not executed 		<ul style="list-style-type: none"> ✓ Modify the new site preference file to add the custom entries from the old preference file ✓ Ensure that the TCEng data configuration process is performed on Unix ✓ Ensure that all required scripts prior to upgrade are executed (E.g. convert forms)



FMEA_RPN

Ensuring the above will result in a smooth, less painful and successful upgrade

Process Map For Upgrade – Oracle - Design

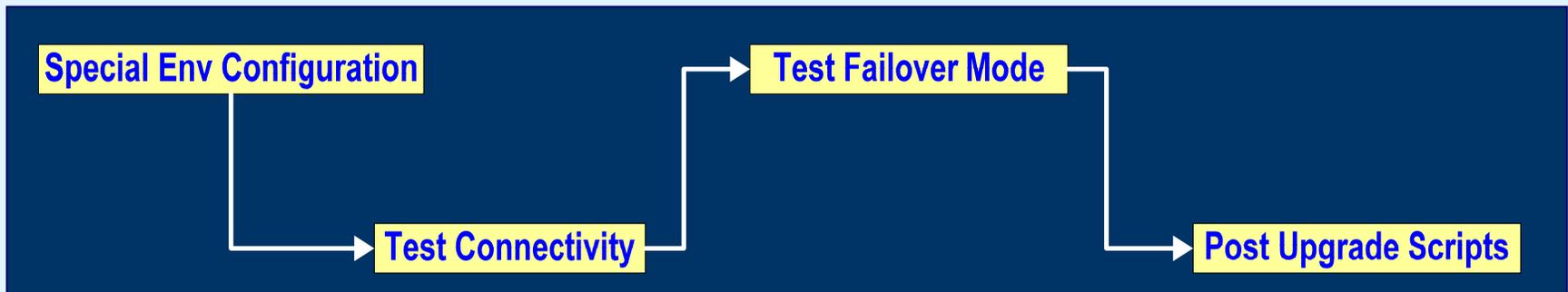
Pre Upgrade



Installation



Post Upgrade

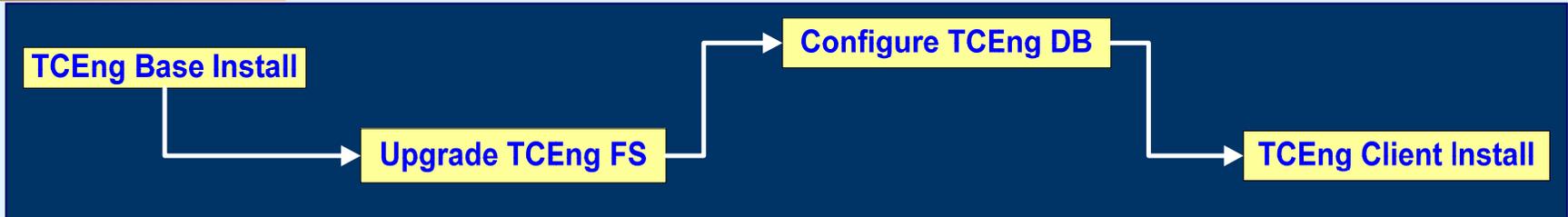


Process Map For Upgrade – TCEng - Design

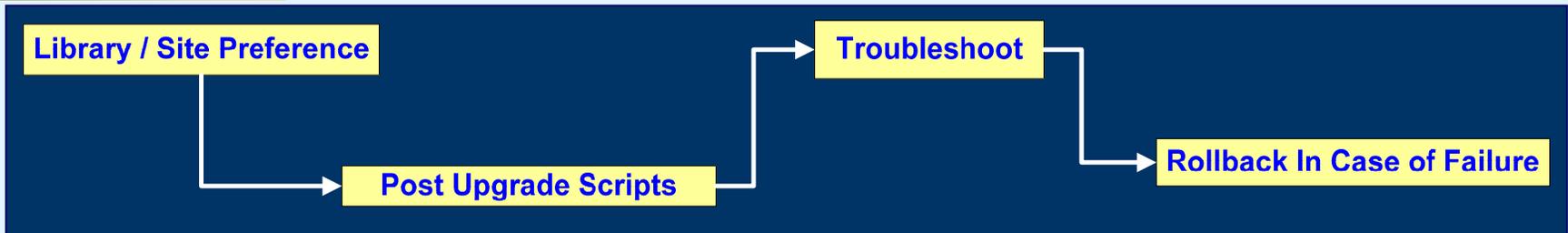
Pre Upgrade



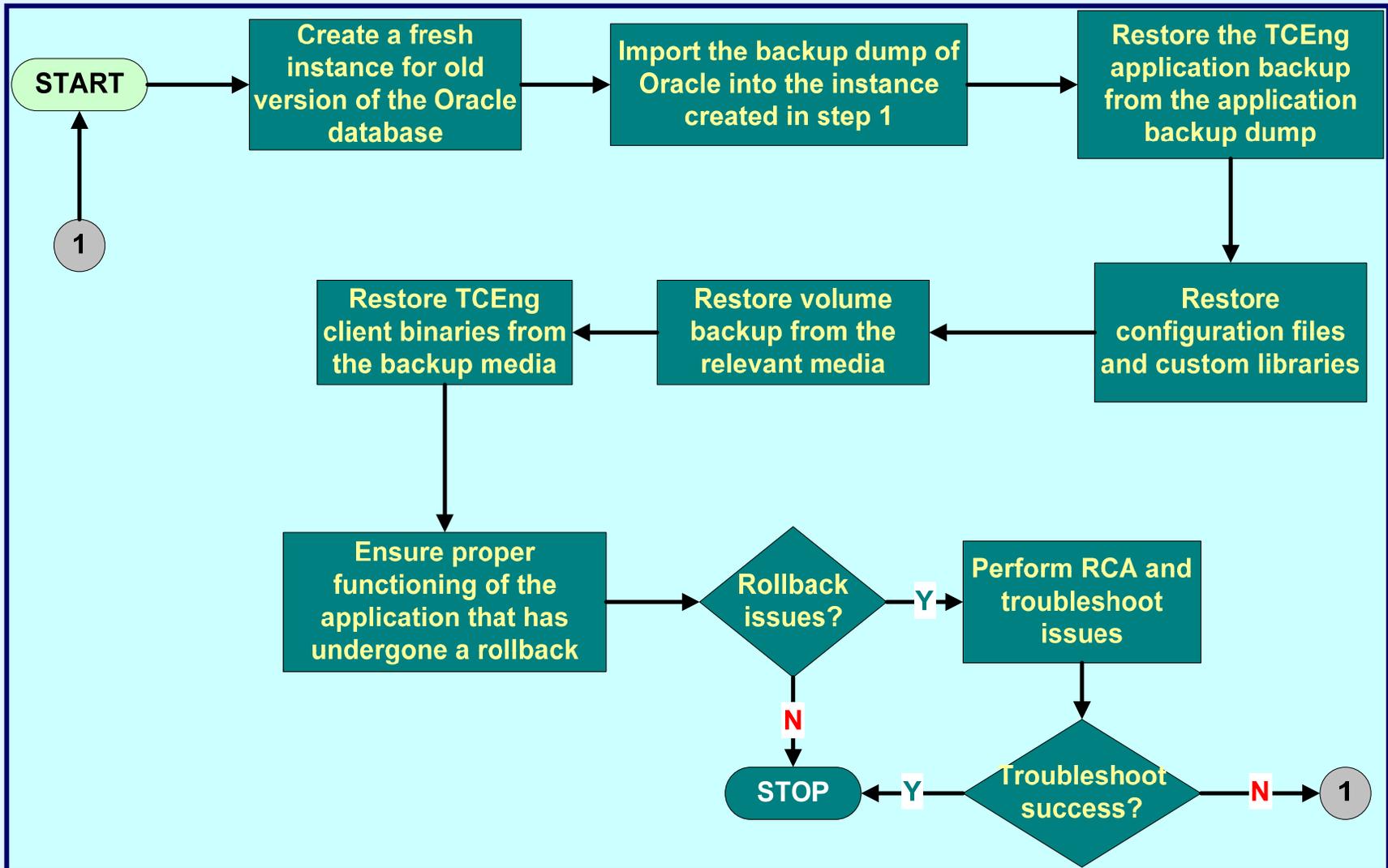
Installation



Post Upgrade



Process Map For Rollback - Design



Verification Of Process – Pilot Upgrade

☺ Oracle Errors – Checkpoints evaluated

- ✓ System Kernel Parameter definition
- ✓ Cluster environment
- ✓ Oracle backup and import
- ✓ Database Sizing

☺ TCEng Errors – Checkpoints evaluated

- ✓ Pre installation errors – convert forms executed for converting to class based forms
- ✓ Database configuration – Performed in Unix for correct configuration of TCEng data

☺ Outage window was shorter – Upgrade performed during the weekend

☺ Time taken for upgrade was 3 days

☺ No rollback was performed since errors were not encountered

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Q & A