3rd Annual Best Practices Conference, Richardson, Texas

Improving Software ROI through Requirements Validation

A Web Based Wireless Order Management System

September 24, 2002

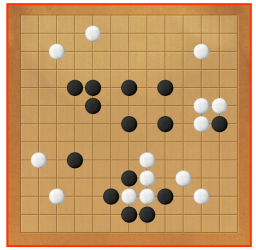
David Cohen, Ph.D.,
President

sente 先手
Corporation 株式会社

www.sente.com

david@sente.com

sente means competitive initiative in the game “Go”



Our focus is on productivity enhancements through Faster:

- delivery of customer solutions
- delivery of information to users
- implementation of organizational changes

Overview

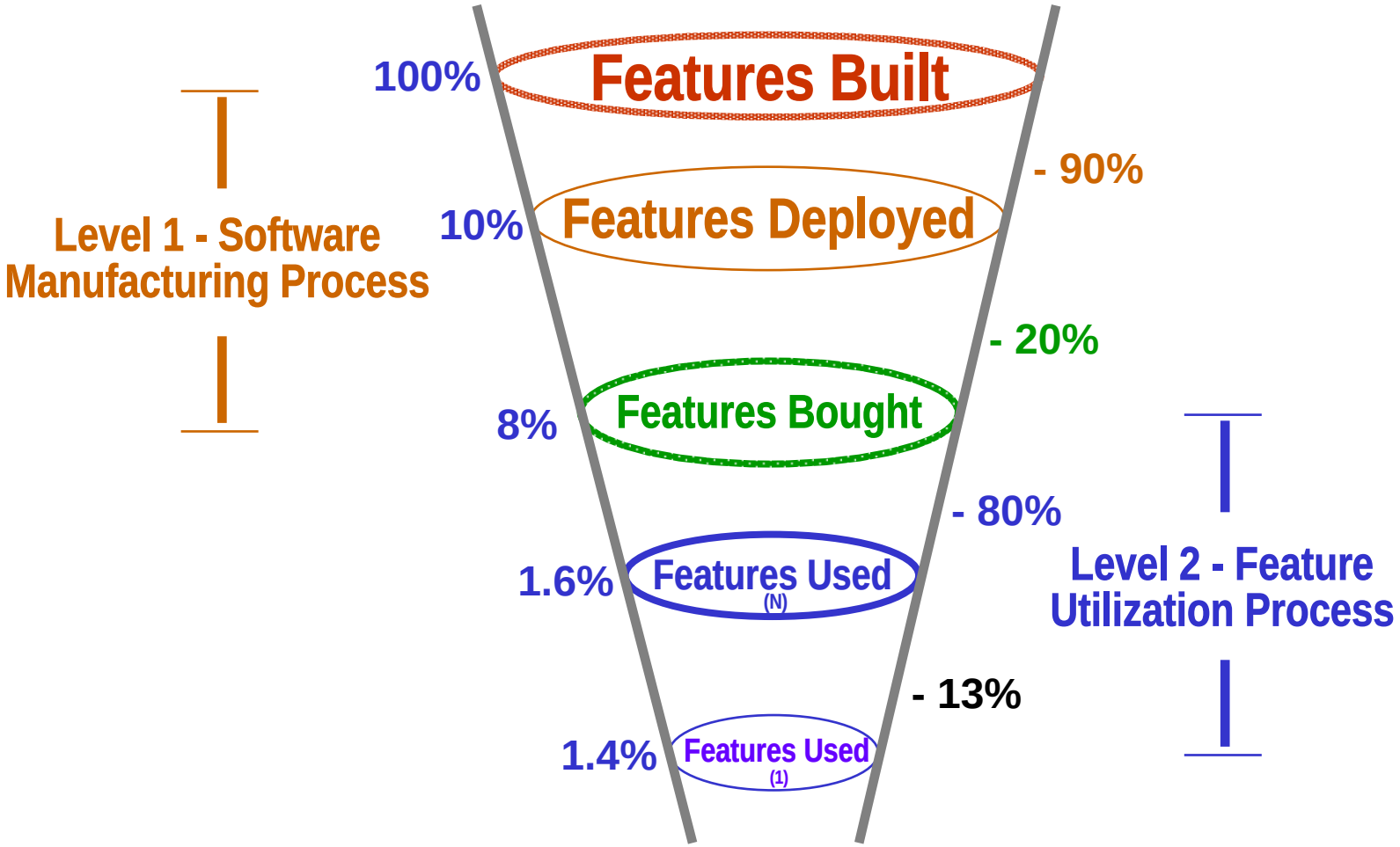
sente Corporation

1. **Software Investment Insights**
   - Existing Requirements-Driven Development-Paradigm **Rarely Delivers** a Good Return on Investment (ROI)
   - **The Challenge is to Deliver Solutions vs. Software**
     - **Software Pollution™**
     - **The Ever Increasing Development Backlog**
     - **Requirements Validation**
       - **deploy order of magnitude better investments**
     - **E-Type vs. S-Type Software Systems**
2. **The *eccm* toolkit capabilities for Requirements Validation**
   - **Architecture, User Interface, Business Rules**
   - **Configuration Management, Operational Processes**
   - **Center Productivity Management**
3. **Summary**

Software Pollution™ (1/2)

Feature Manufacturing and Utilization Analysis

sente Corporation

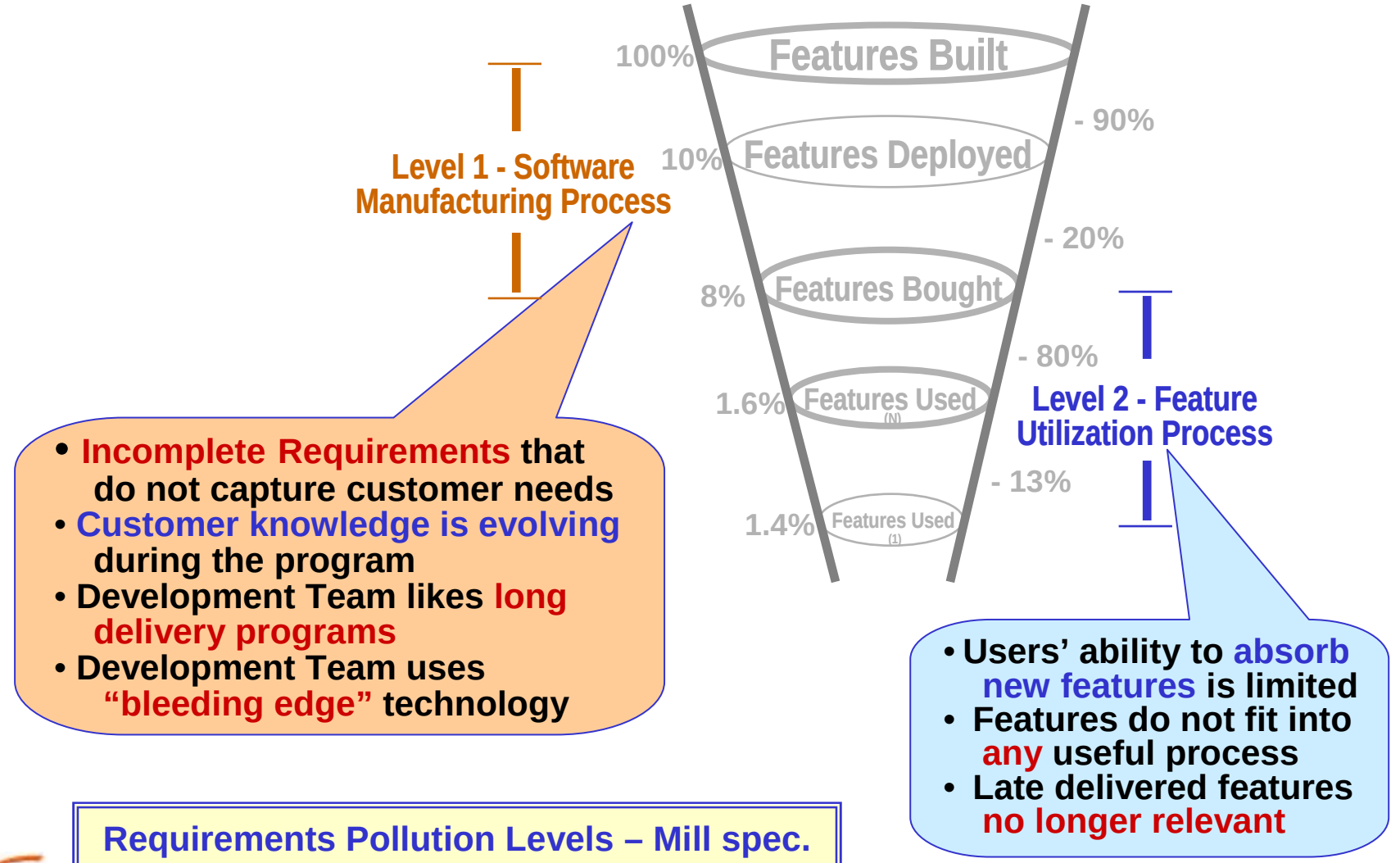


Ability to Remove Features
Guide Re-engineering Programs

Software Pollution™ (2/2)

Feature Manufacturing and Utilization Analysis

sente Corporation

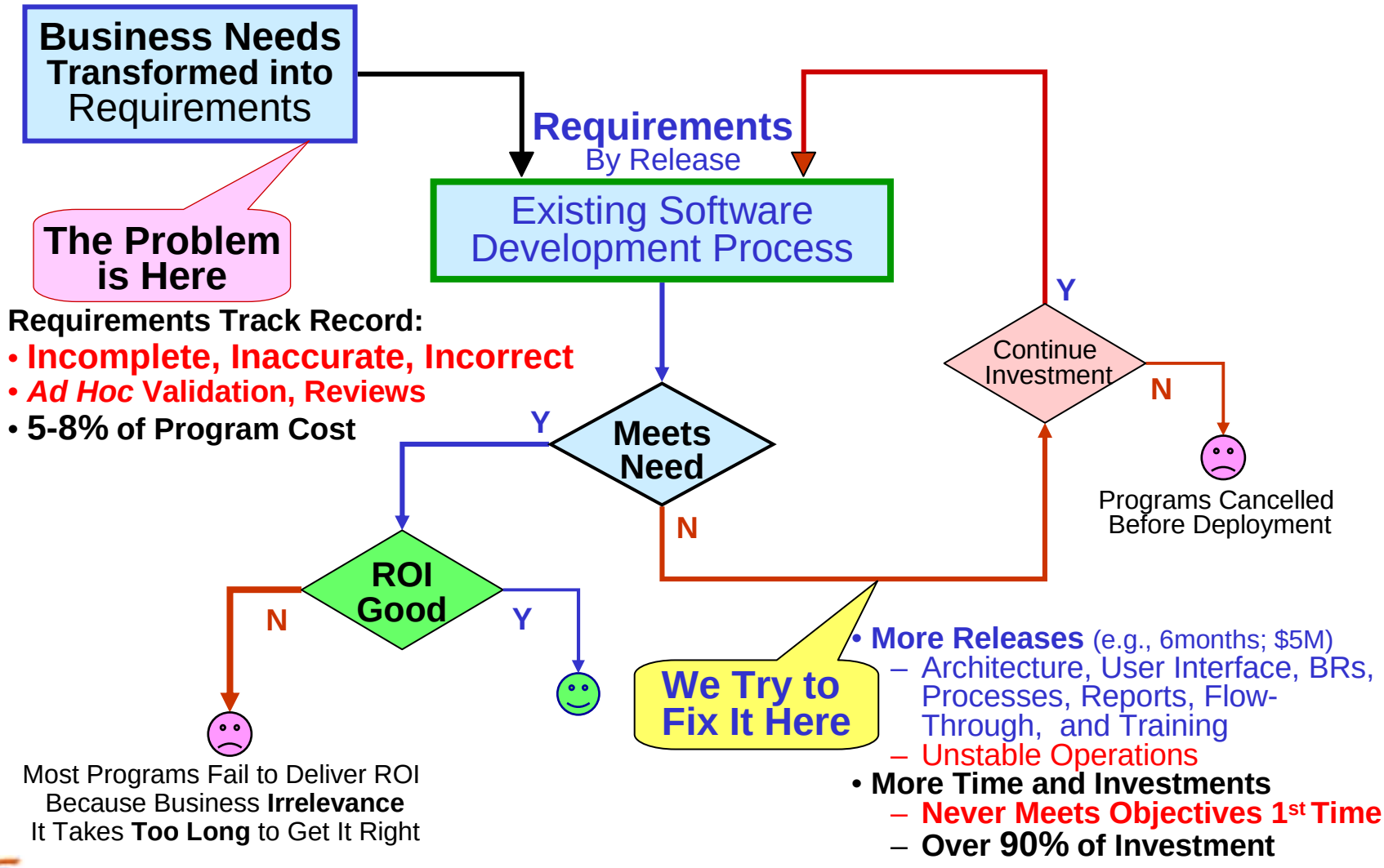


Requirements Pollution Levels – Mill spec.
A Spec 100:1 B Spec 60:1 B1 Spec 25:1

Software Investment (1/5)

The Requirement Driven Paradigm Fails to Deliver ROI

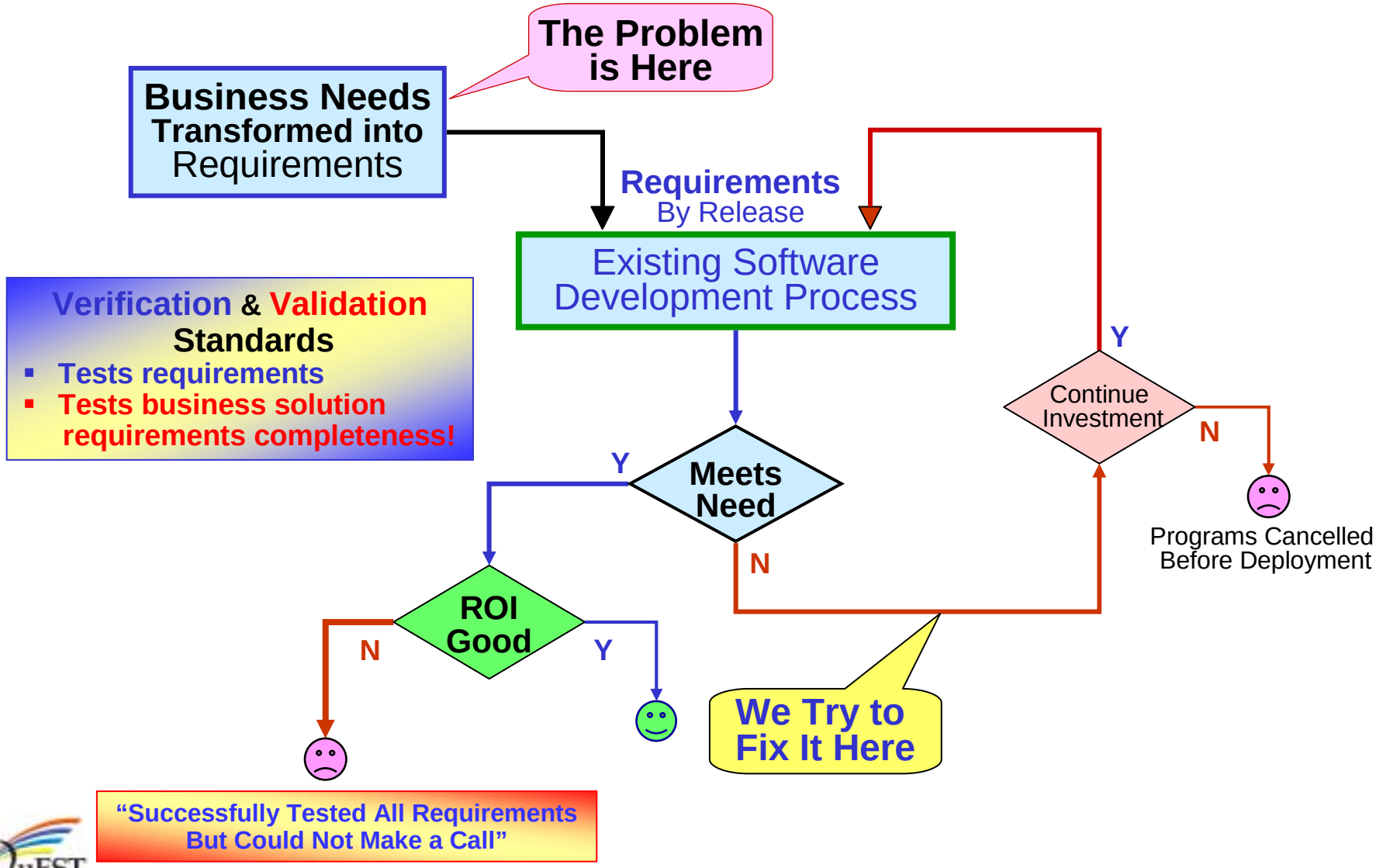
sente Corporation



Software Investment (2/5)

Requirements Verification and Validation Standards

sente Corporation



The DEAL That Worked Well for Over Half a Century (Investment Paradigm)

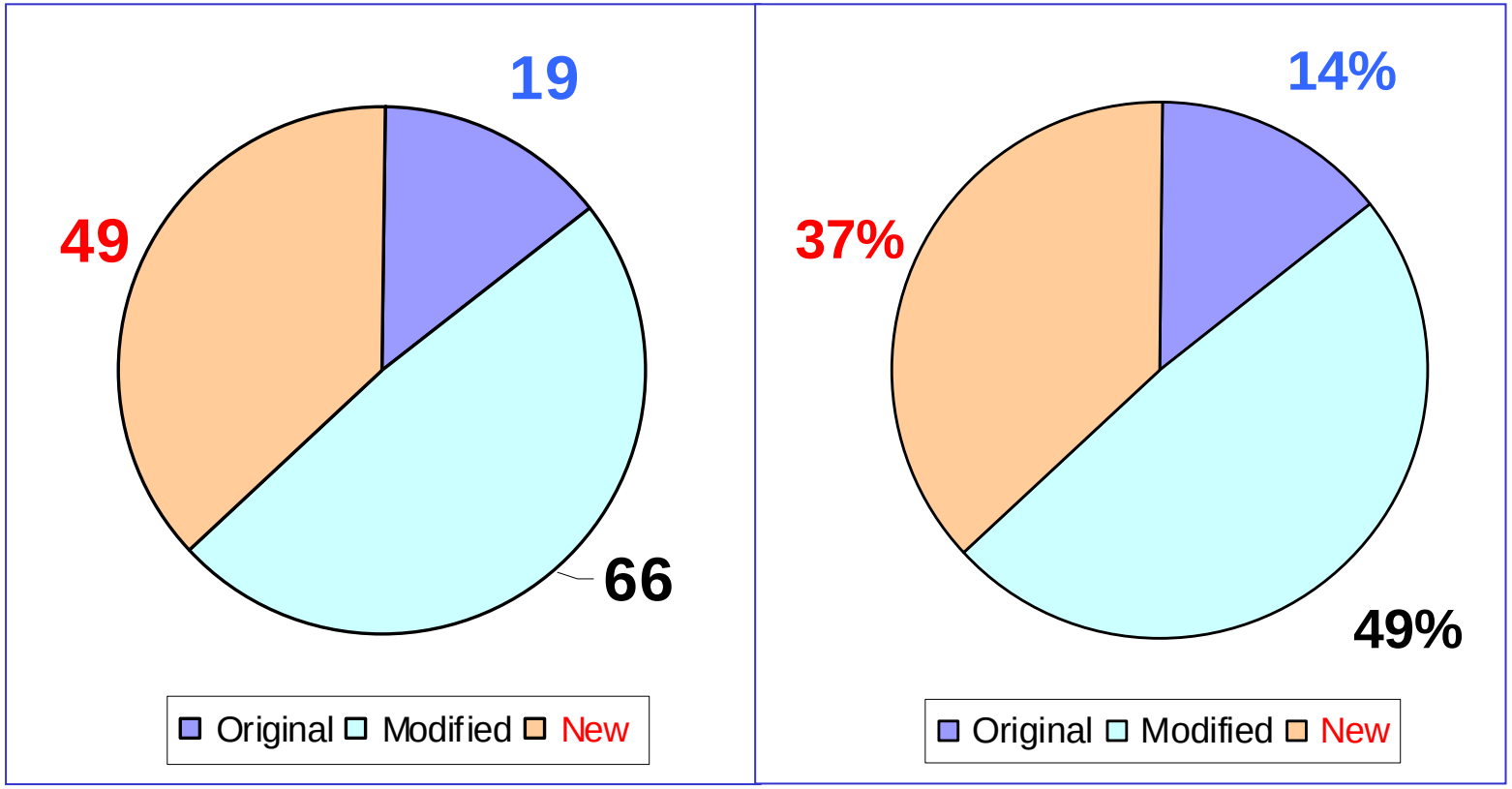
sente Corporation

- **The Business Invests in Software Solutions Based on Incomplete and Inaccurate Requirements**
  - the business unit produces the requirements; therefore, **it is its own fault** when the solution is unsatisfactory
  - the development team sticks to "feature coding assignments"
- **The Business Is Required to Continue Funding Enhancements to an Unsatisfactory Solution**
  - the solution is not able to keep up with the evolving business needs (new or newly learned); revenues/customers lost
  - the users are continuously living with incomplete (irrelevant) solutions; manual workarounds are the norm
- **The Development Team Is Rewarded With Ongoing Funding While It Delivers Barely Relevant Solutions**
  - **not accountable for ROI** and shows no interest expanding scope beyond "feature development"
  - System Integrators (SIs) are doing *barely better*
    - they cleverly shift accountability back to business unit
  - Recently acknowledged failures of supply chain management vendors

Prem to Prem MEGALINK Order

Business Rule - Validation Results

sente Corporation



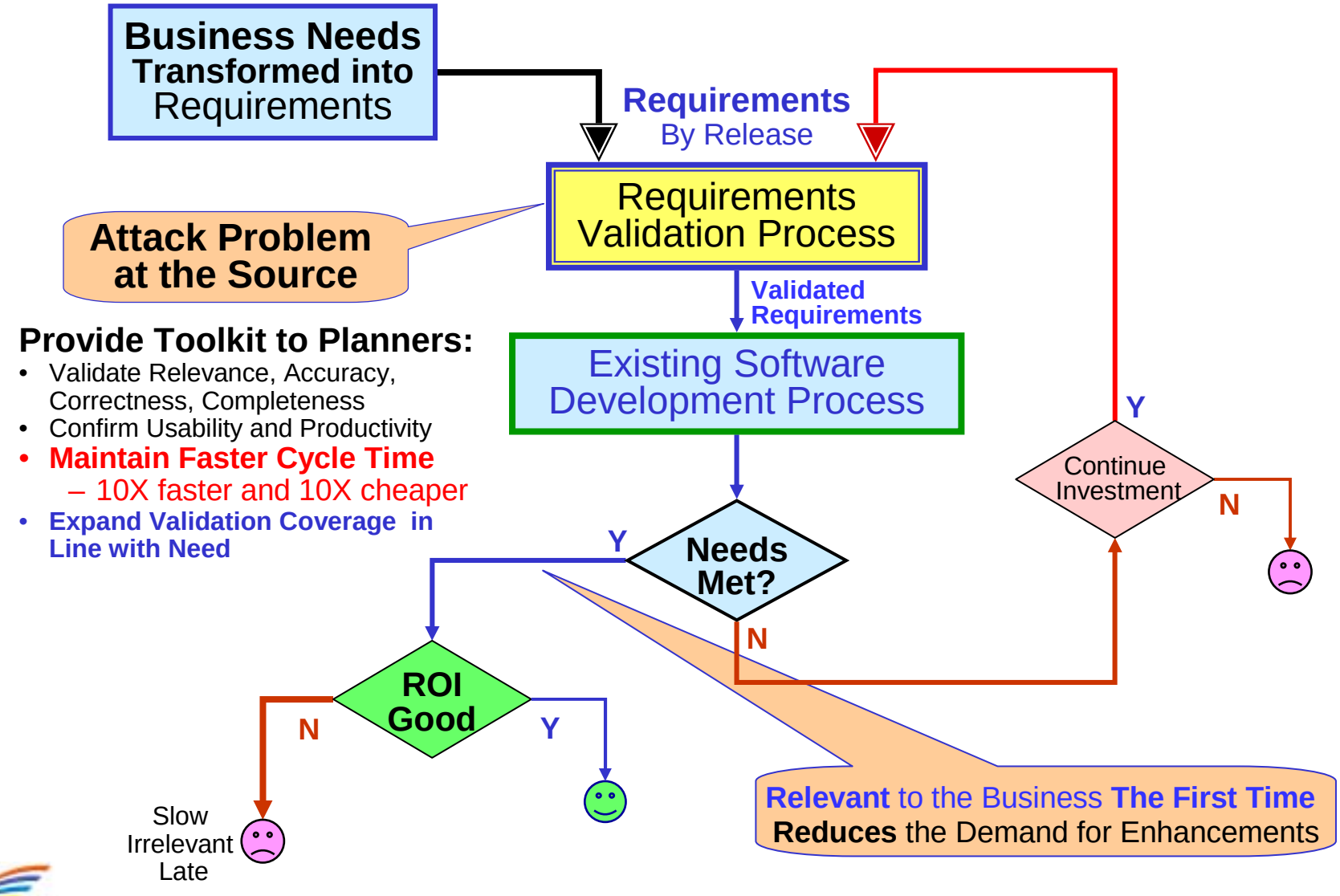
The Business Rules Were Professionally Maintained

Two Orders of Magnitude More Complex Than "Boolean Expressions"

Software Investment (3/5)

Improve Requirements Completeness through Validation

sente Corporation



Provide Toolkit to Planners:

- Validate Relevance, Accuracy, Correctness, Completeness
- Confirm Usability and Productivity
- **Maintain Faster Cycle Time**
  - 10X faster and 10X cheaper
- **Expand Validation Coverage in Line with Need**

Definition of S-Type vs. E-Type Systems

The Vendors' Economic Incentives Drive the Results ***[Lehman 85]***

sente Corporation

S-Type System **(M. Lehman, "Program Evolution: Processes of Software Change," Acad. Press,1985)**:

- **Specification based software** treats each release as reflected by the requirements; no capabilities are added to reflect life cycle expectations beyond software maintenance (e.g., operating system, DBMS, platforms)
- **Software is always getting bigger, more complex with an incrementally reduced capability to fix bugs or adding features cost effectively**
  - **There is a clear dependency between the demand for new features and increased software complexity** (cause and effect)
  - **The ROI is getting incrementally worse – we never hit the wall because the business unit is forced to reduce feature-demand by relevance and cost considerations**
  - The IT Organization **has only ONE alternative**, that is to **start a new replicated development program** to fight the "software development bottleneck" *(developers rarely able to reuse previous platforms because of code ownership, obsolescence and reuse considerations)*
  - Software pollution becomes an ROI measure (increased pollution reduces solution's life cycle)

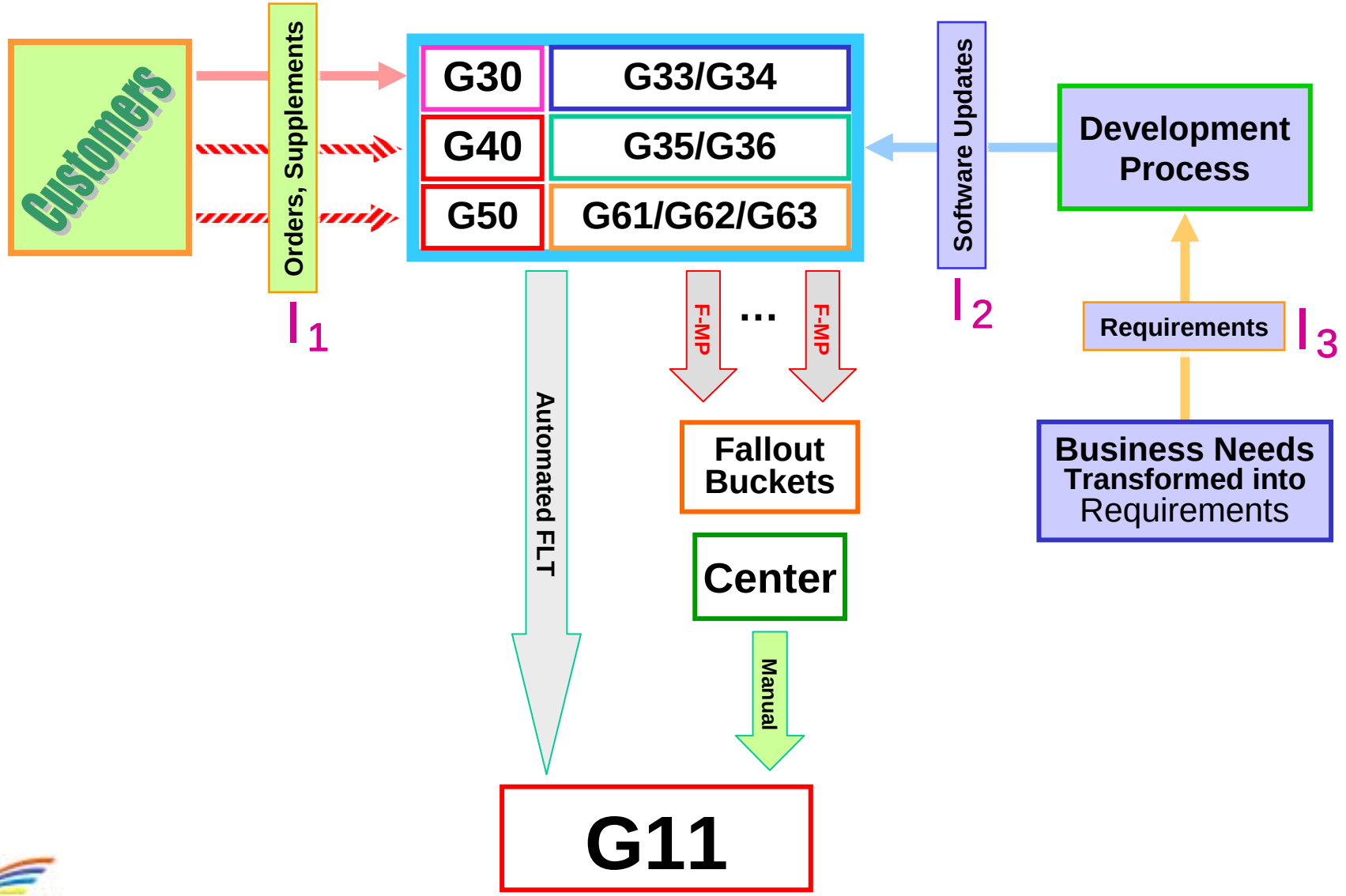
E-Type System:

- **Evolution based software** is designed to handle tasks and to evolve with *expected* changing needs through configuration management (CM) capabilities
  - **Requirements are viewed as representative of possible needs** into the future
  - Success criteria includes **the ability to expand capabilities without software development** (e.g., new business rules, process changes, report changes)
  - Software complexity of E-Type systems is increasing at a **slower rate**
  - **Software complexity is proactively reduced** through
    - reimplementation of functionality with increased e-capabilities
    - removal of features that are no longer needed/used but add complexity and maintenance cost
- A **validation platform** can be used to validate requirements reducing the software churning in search of the "true" business-need definition (requirements)

Software Investment Model (4/5)

Automatic Flow Through Processing

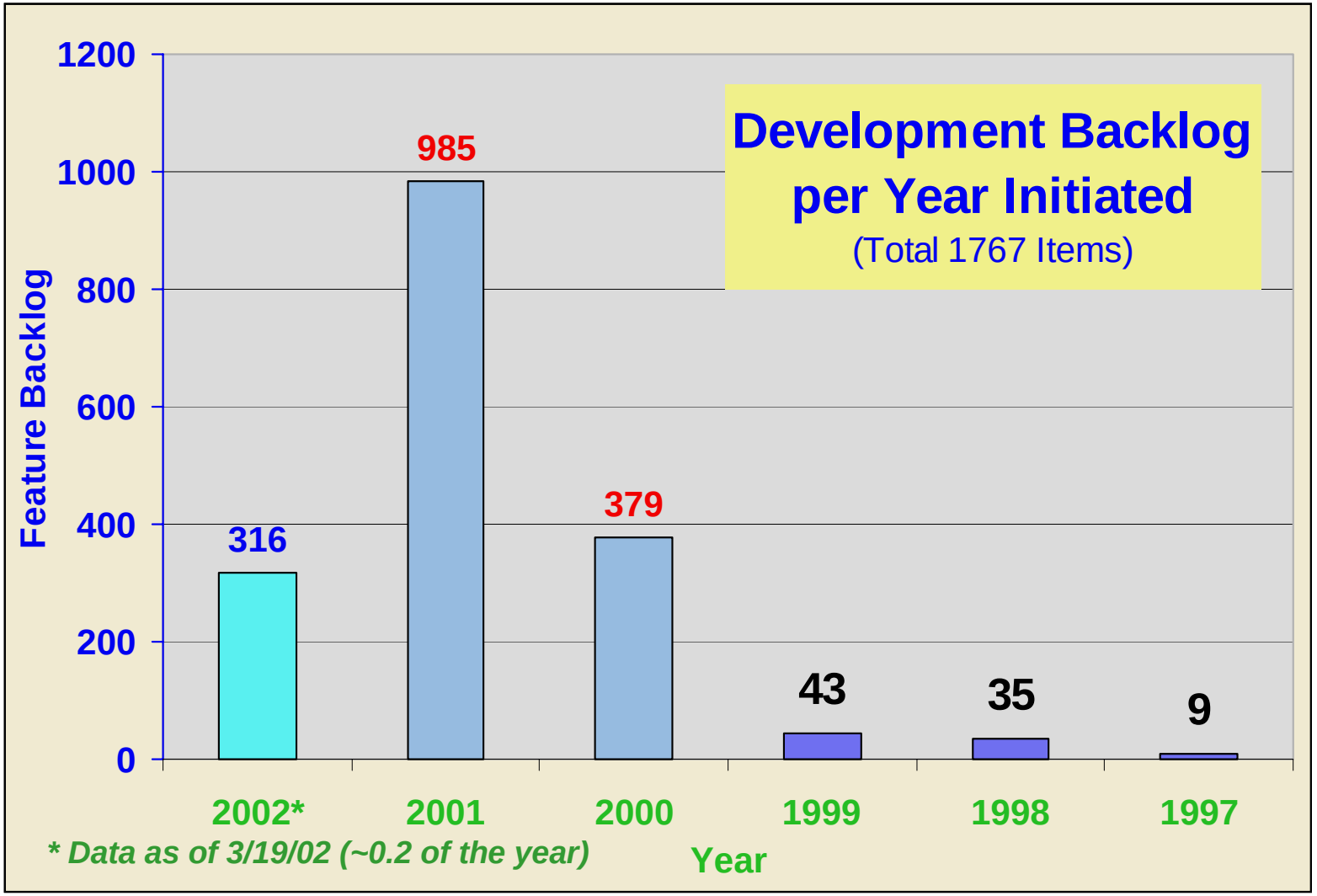
sente Corporation



Feature Development Backlog per Year

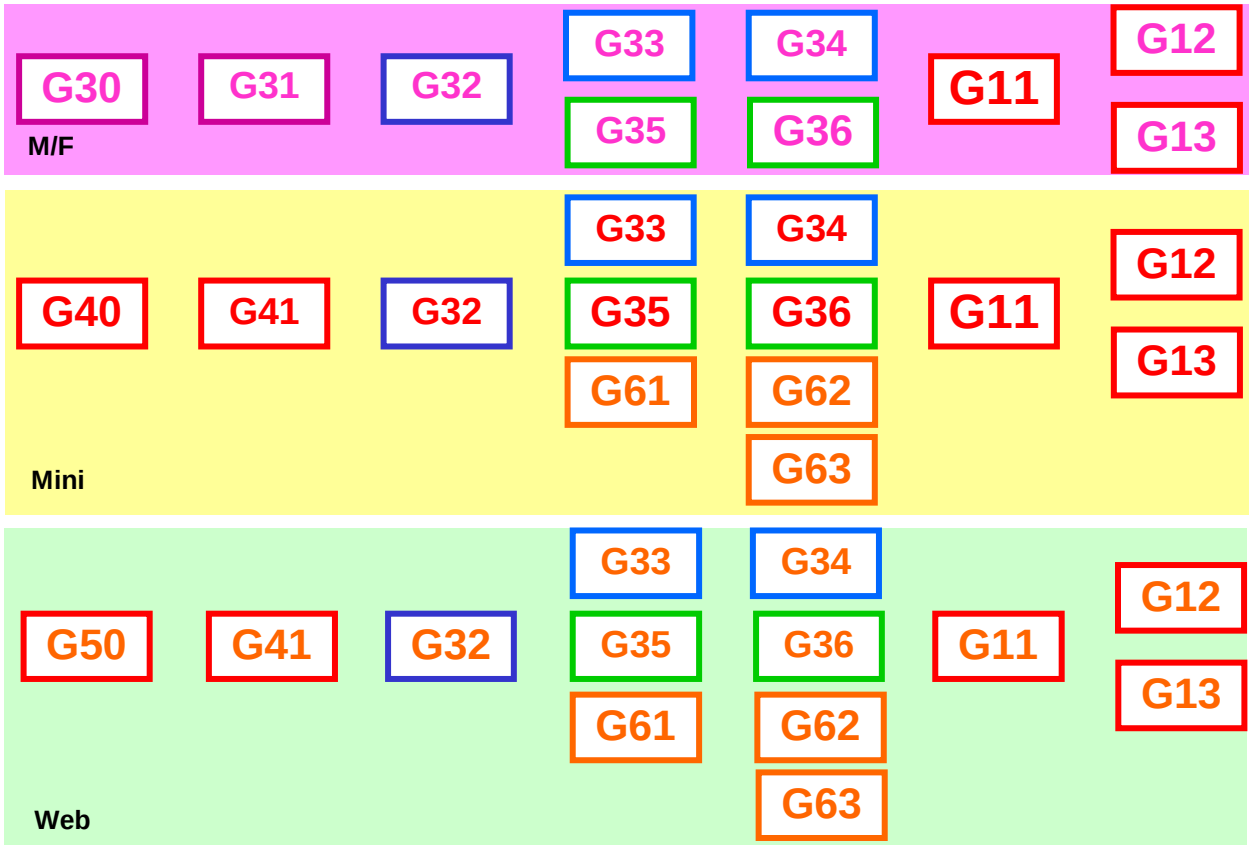
Historical Summary (e.g., 9 features still open since 1997)

sente Corporation



Evolution of a Legacy Solution

sente Corporation



A Solution's Life Cycle

1. *New needs cannot be satisfied by existing solutions because of a large feature backlog, limited development-team throughput and high cost*
2. *A new solution is approved that is promised to be faster and cheaper (there is no alternative)*
3. *The new solution is late to meet initial commitments*
4. *A feature backlog develops for the new solution*

Software Bottlenecks Are Generic and Predictable

Wireless Center - Business Need

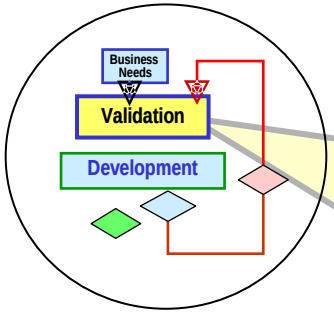
sente Corporation

- **Responsible for provisioning data circuits for the wireless industry**
  - connectivity between switches, antennas, etc.
- **Over 500 customers (revenue $2B/year)**
  - 50 Reps, 40 System Designers
- **Over 80,000 orders per year**
  - orders are received in the center through faxes and emails
  - it takes an average **~1.5 hours** to process an order per Rep *including related clarifies and escalations*
  - each new order must be processed within 12-24 hours
- **Center staffing growing ~30% per year in line with customer orders**
  - recruiting is major challenge
    - it takes **~6 months** to get a new Rep trained/productive
- Success Criteria: **Improve Rep Productivity to Eliminate Staff Growth**

Software Investment (5/5)

Supports Validation of Capabilities in Six Key Areas

sente Corporation



Architecture Configuration Management

Web Based UI

electronic customer contact management

eccm Toolkit

Release V.28

Business Rules

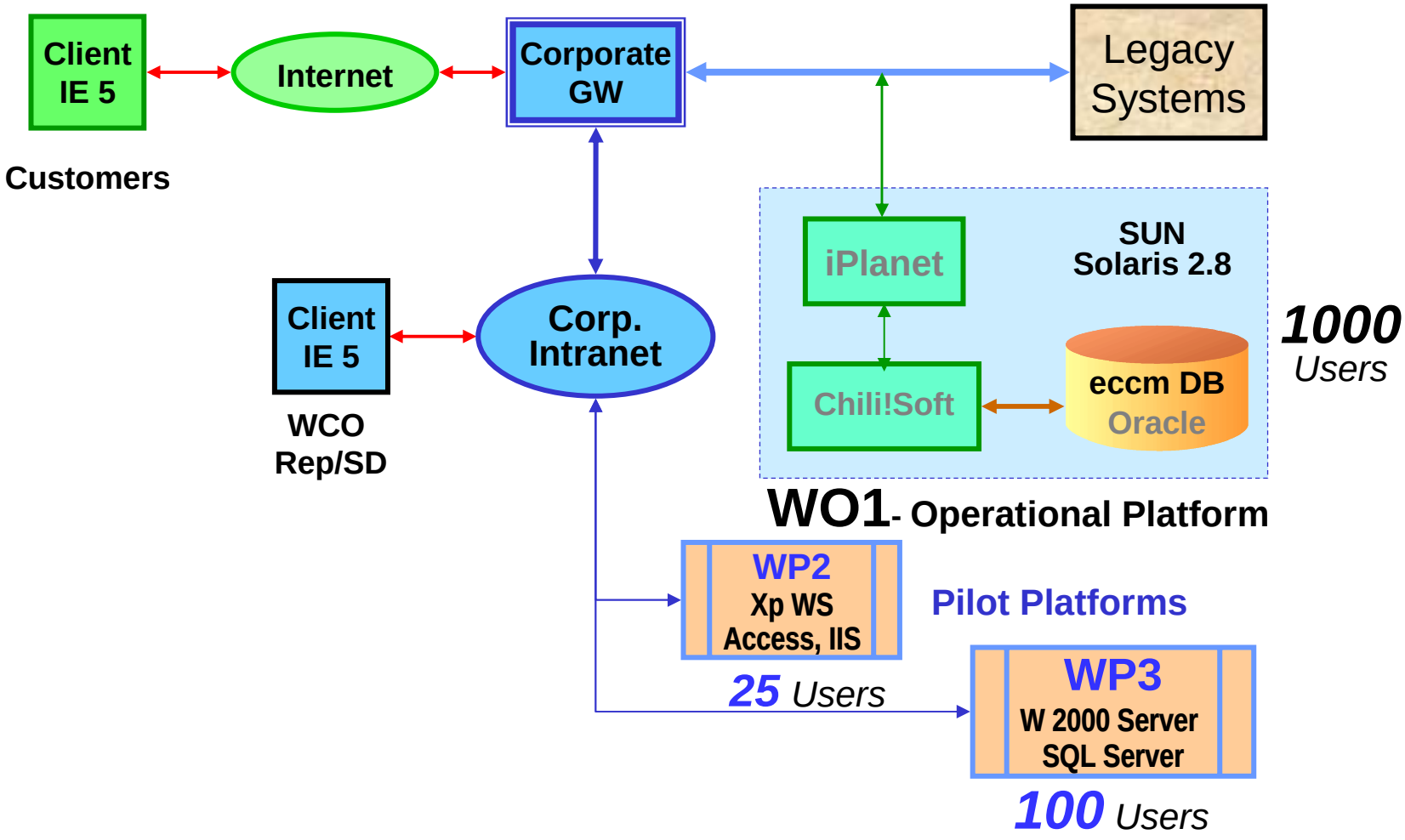
Operational Processes Center Productivity Management

- 10 Times Faster Cycle Time (Robust)
- Validation Coverage Expanded with Need

Deployment Strategy and Architecture

Managing Change Management

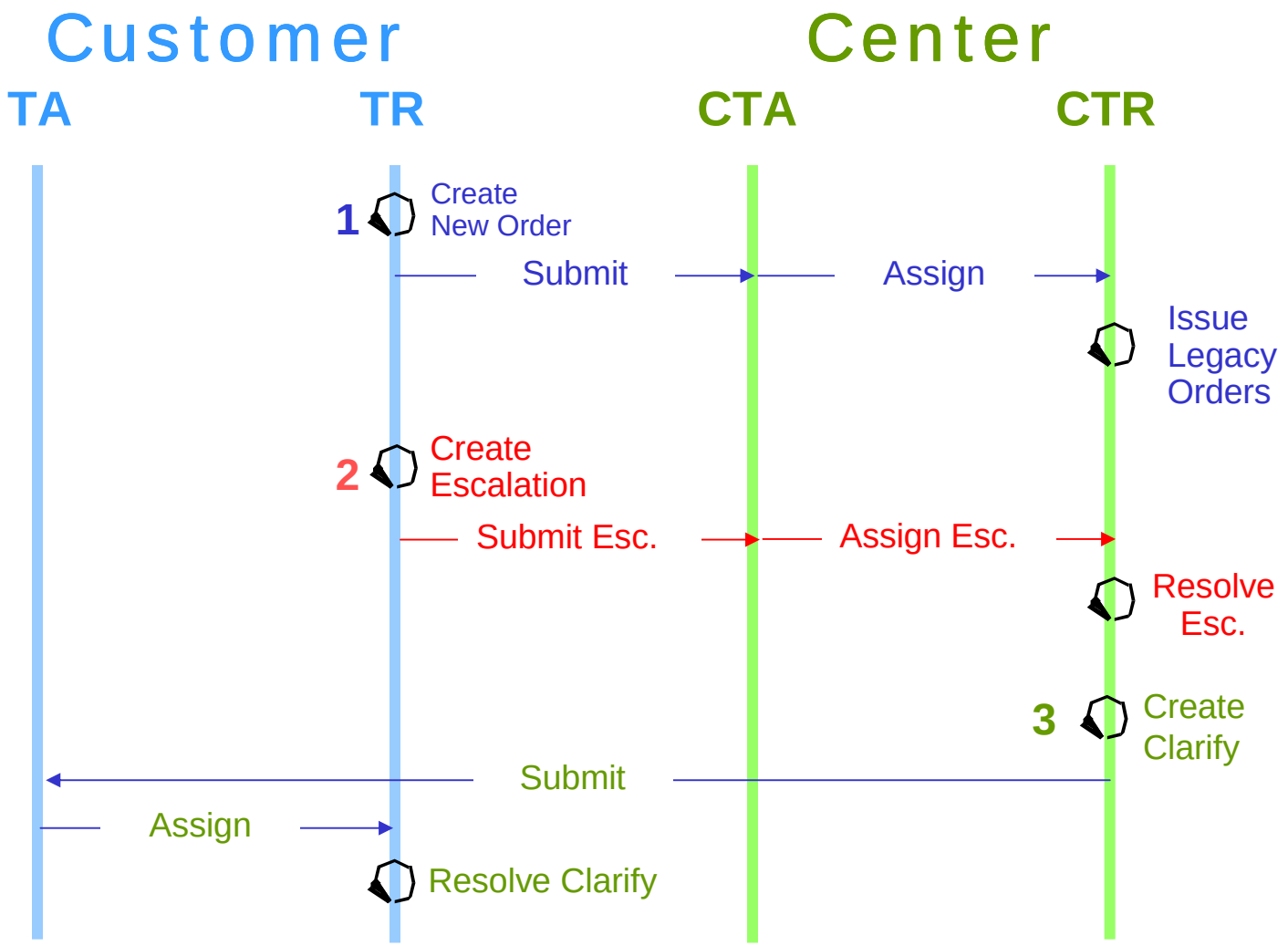
sente Corporation



Operational Processes Validation

Create New Order, Escalation and Clarify Processing

sente Corporation



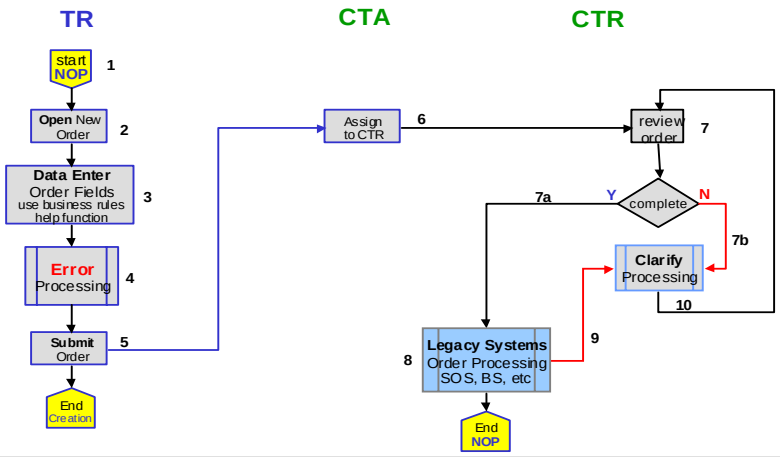
Process Definitions in (1+4)D

sente Corporation

Description
New Order Processing

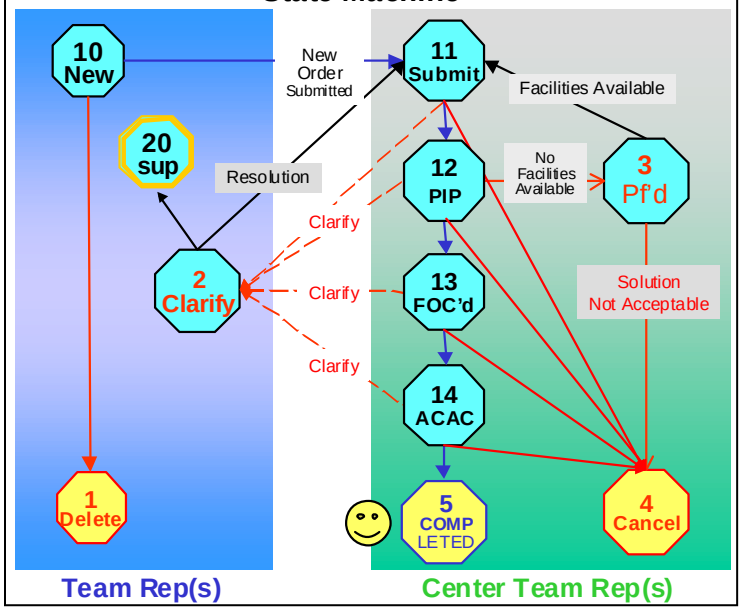
1. Initial Conditions: The Customer Wants to Purchase a Link (e.g., Prem to Prem) to Meet their Wireless Network Needs.
   A TR is assigned by the TA to Create a New Order in Line with the business needs.
2. The TR Logs-in to the ***eccm*** application:
   - selects Prem to Prem MEGALINK/Light/Plus
   - selects Create New Order
3. The TR Data Enters the details of the new order - one field at a time
   - periodically the TR saves the content of the order
   - periodically the TR may verify completeness of the order
     - error messages will be presented in a separate window
     - errors can be fixed incrementally or once the data entry was completed
   - if necessary the session can be terminated and the data entry operation can be renewed at a later time
4. The TR makes all the error corrections
   - clicking on each error message will position the cursor at the right field for correction
   - required and conditionally required business rules are enforced
   - data integrity business rules (telephone number, date, email) are enforced
   - any attempt to submit an incomplete order results in automatic verification with all defects presented in the error window
5. The TR Submits the verified (completed) order to the CTA
   - the order status is changed from New to Submitted
   - the TR no longer can make changes to the order unless a Sup Order is created
6. The CTA Assigns the New Order to appropriate CTR
7. The CTR Reviews Order for completeness
   - If the order is not complete issues a Clarify to the TR
8. Initiate Legacy System Processing

Data Flow Diagram
New Order Processing



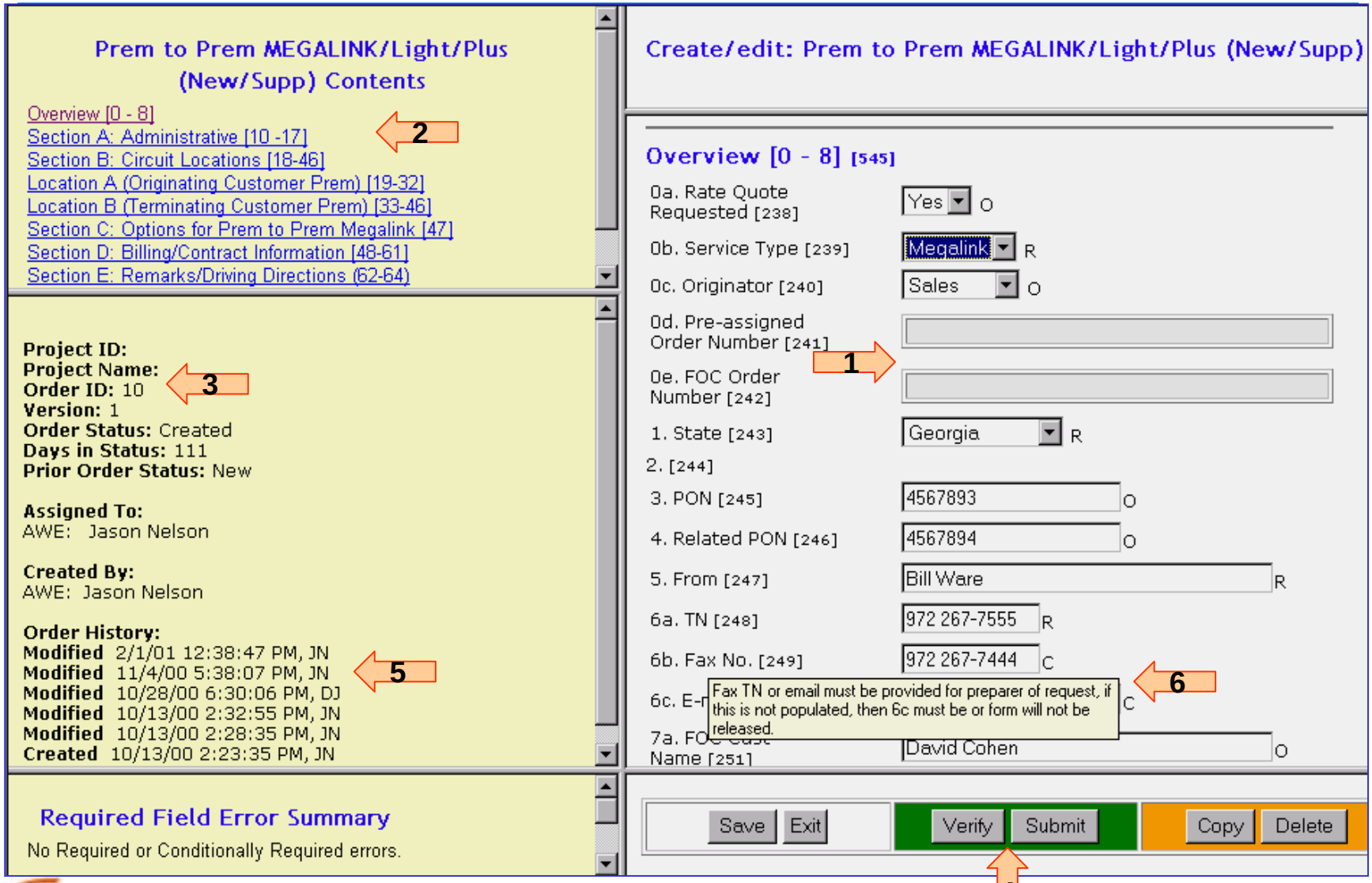
Screen Layouts
New Order Processing (1/23)

New Order Processing
State Machine



Data Entry User Interface

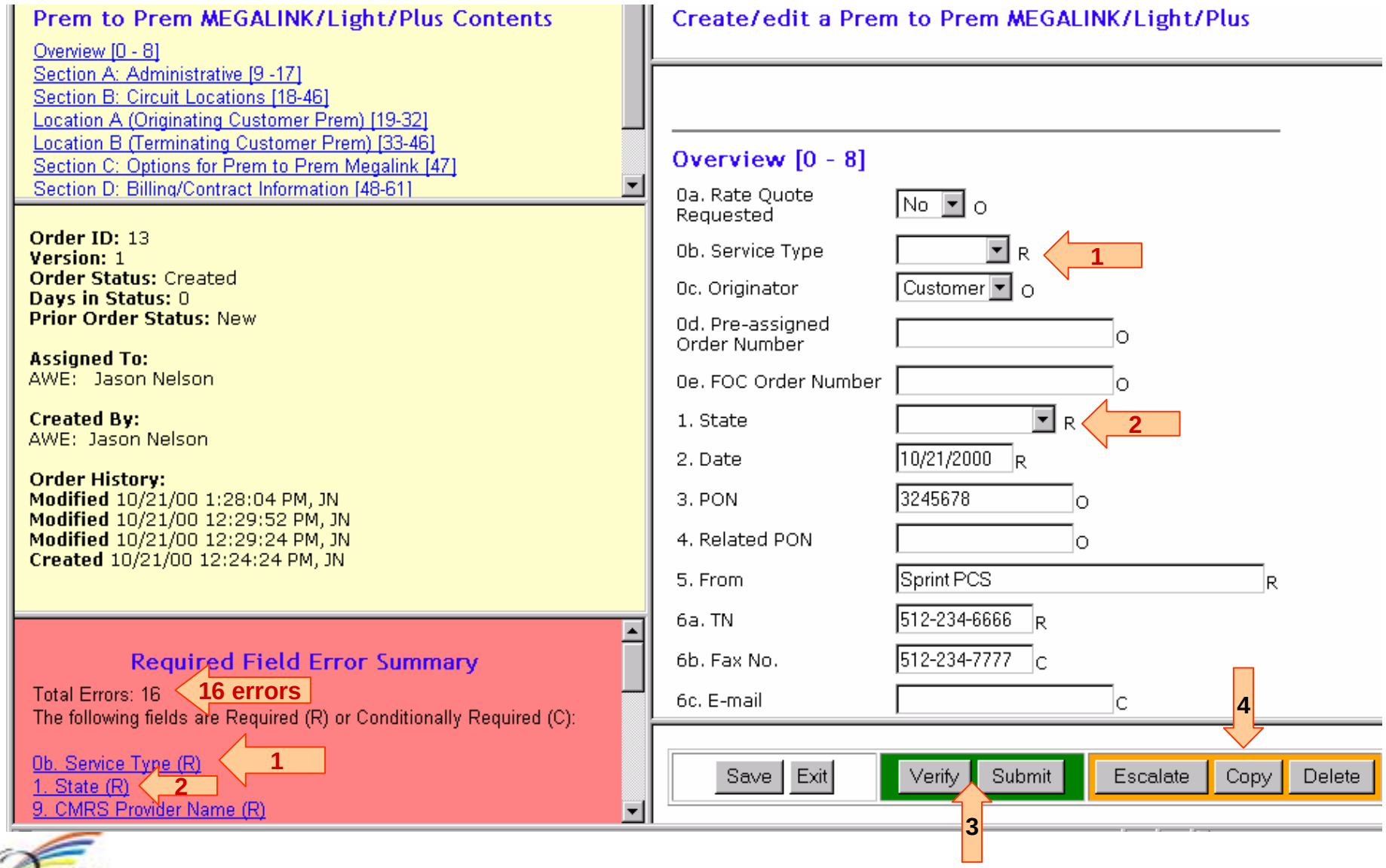
sente Corporation



Training Objective: ONE DAY vs. SIX MONTHS

User Interface
Business Rules Validation

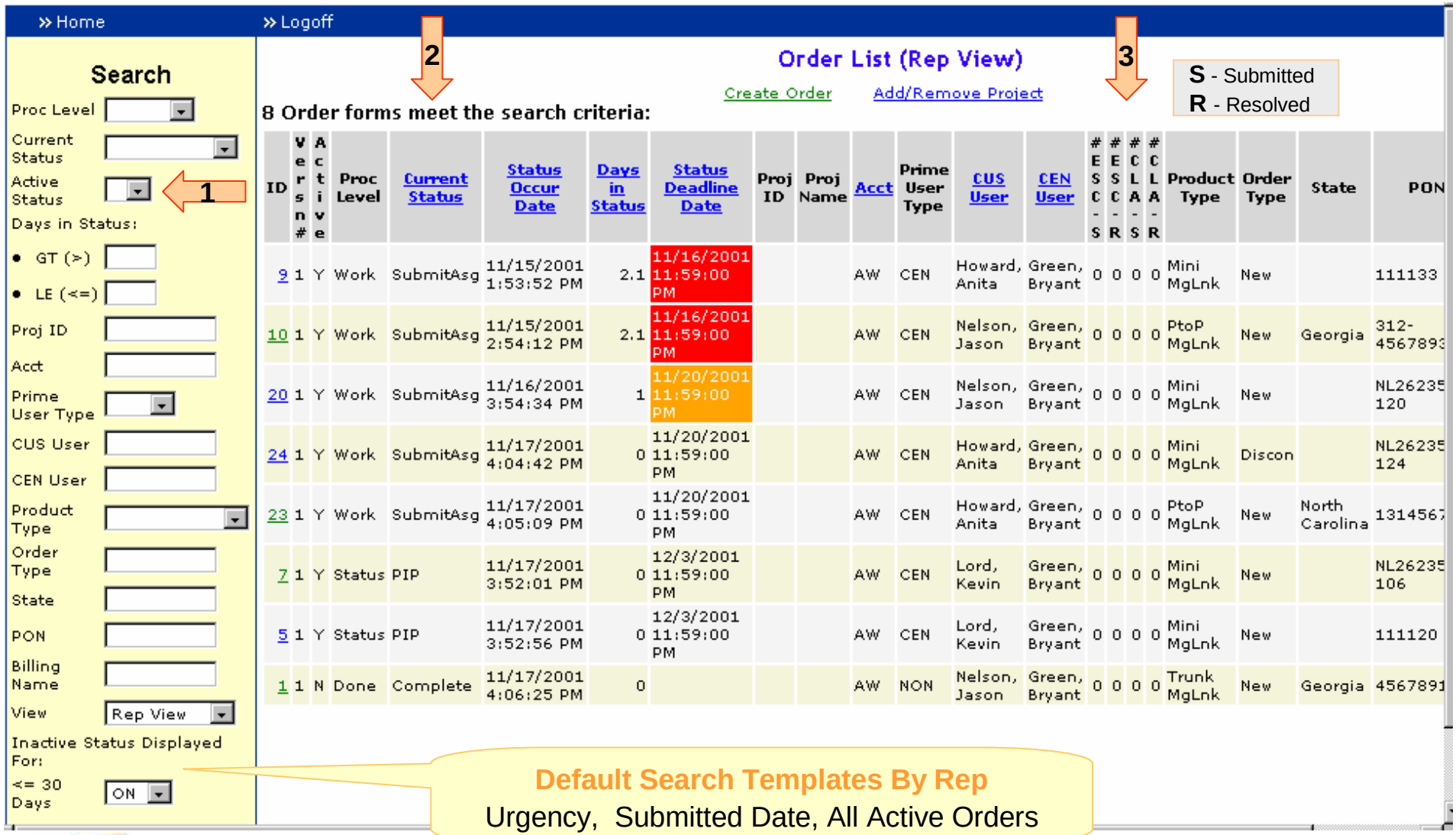
sente Corporation



List of Orders - User Interface

Driving Rep and Team Priorities – Rule Driven

sente Corporation



Default Search Templates By Rep

Urgency, Submitted Date, All Active Orders

Summary CM Capabilities V.28

Fields, Forms, System Parameters, Transition Rules and Access Rules

sente Corporation

Administration

1. Administer Passwords
2. Administer Users
3. Administer Active User Sessions
4. Administer Backup
5. Administer Accounts
6. Administer Organizations
7. Administer Fields
8. Administer Forms
9. Administer Parameters

Management Reports

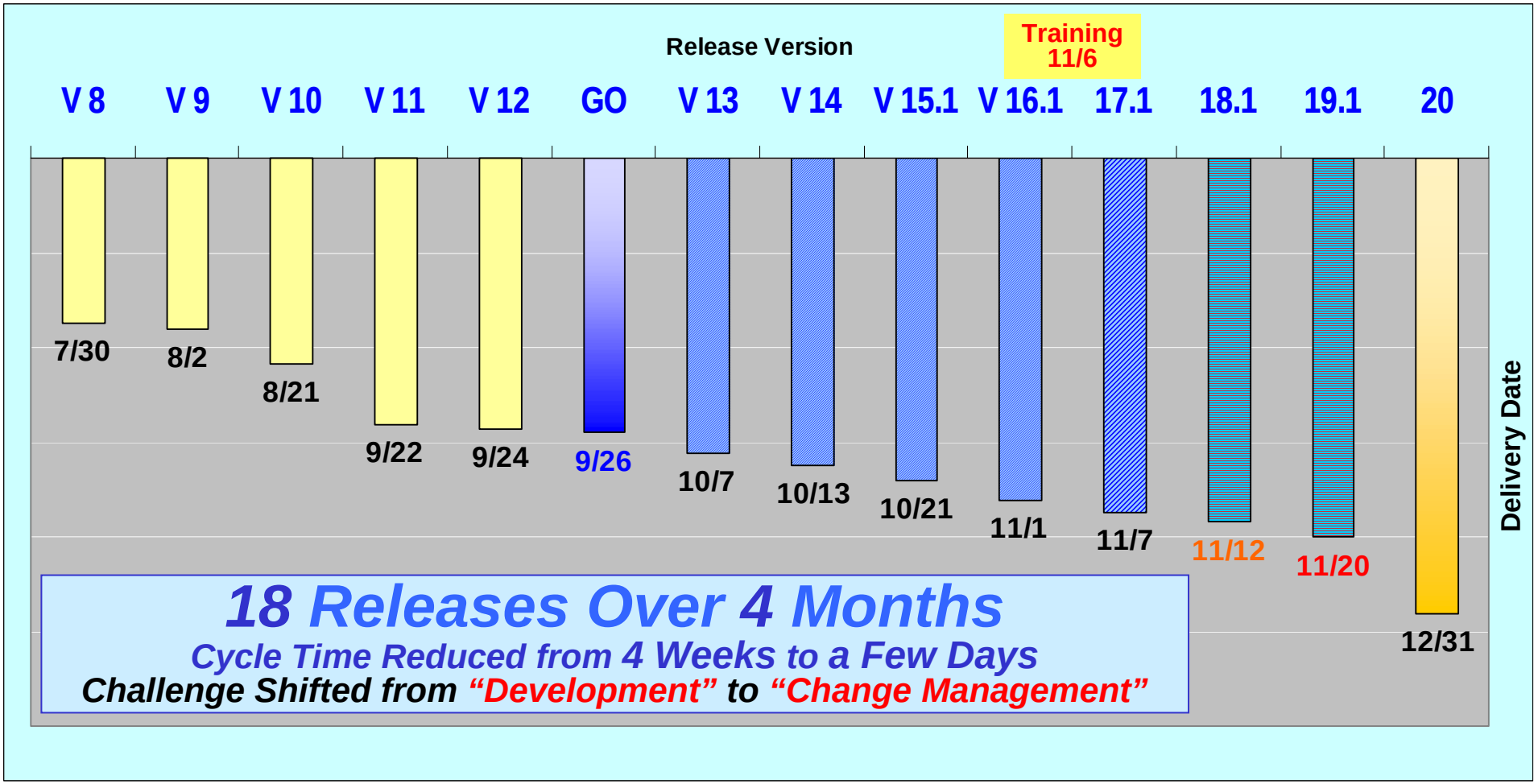
1. Status of Projects
2. Order Tracking
3. Escalation Tracking
4. Clarify Tracking
5. User Session Tracking
6. Field Business Rules
7. Status Transition Rules
8. Status & Field Access Rules

How the Steak is Cooked

FASTER

eccm Software Releases

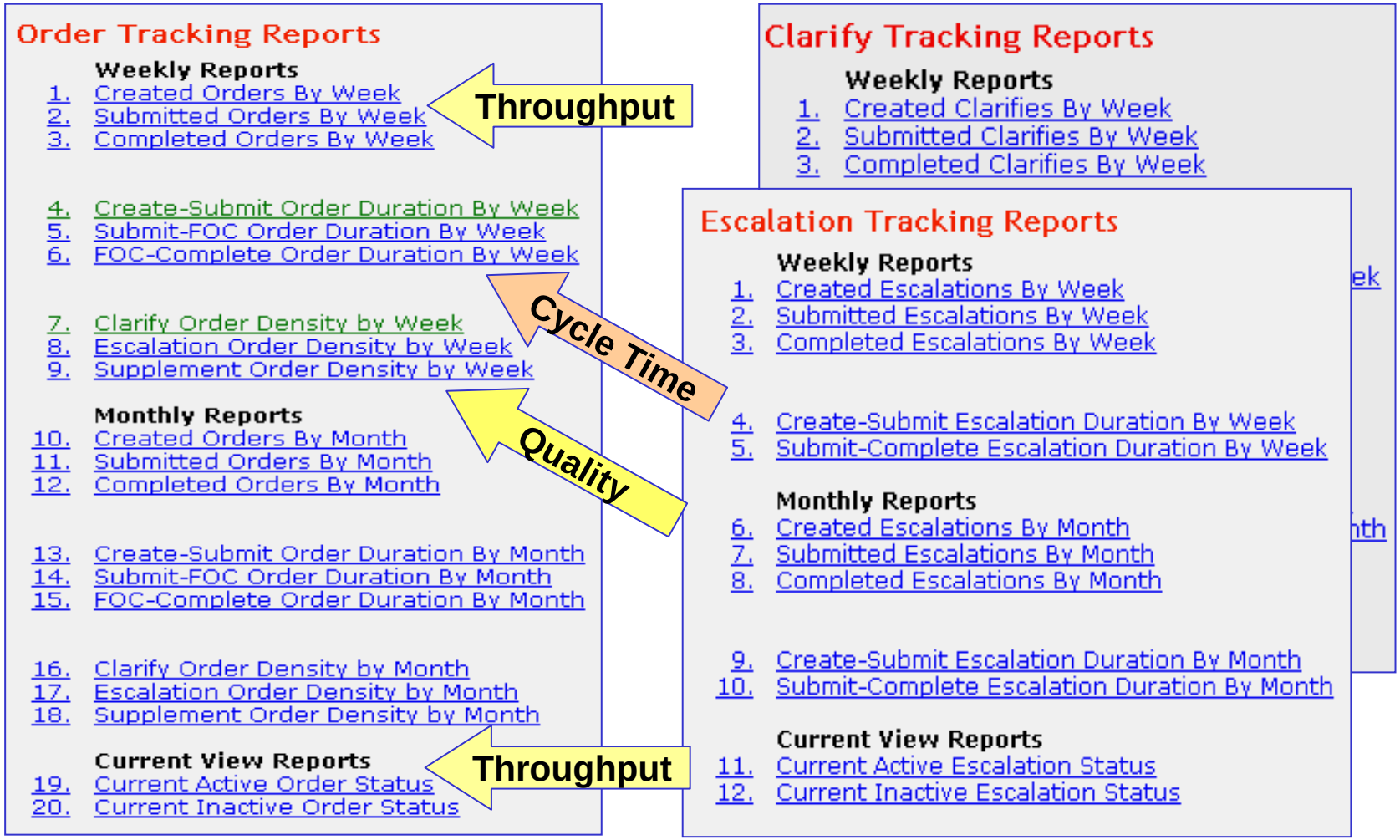
sente Corporation



Center Management Processes

Interval Analysis: Orders, Escalations and Clarifies

sente Corporation

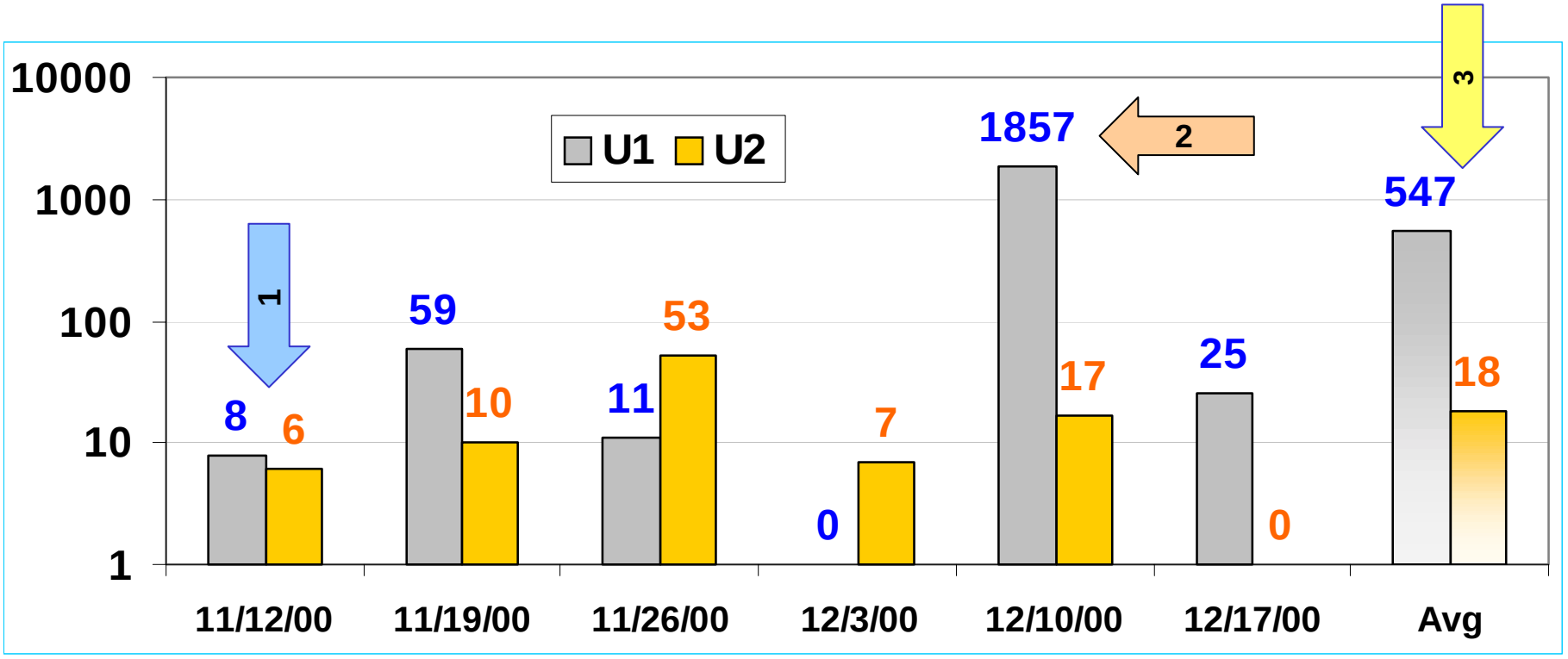


Cycle Time, Throughput and Quality

Order Tracking (1/3)

Average [**Create - Submit**] Interval (minutes)

sente Corporation



Invention of the Copy Command

Summary Results

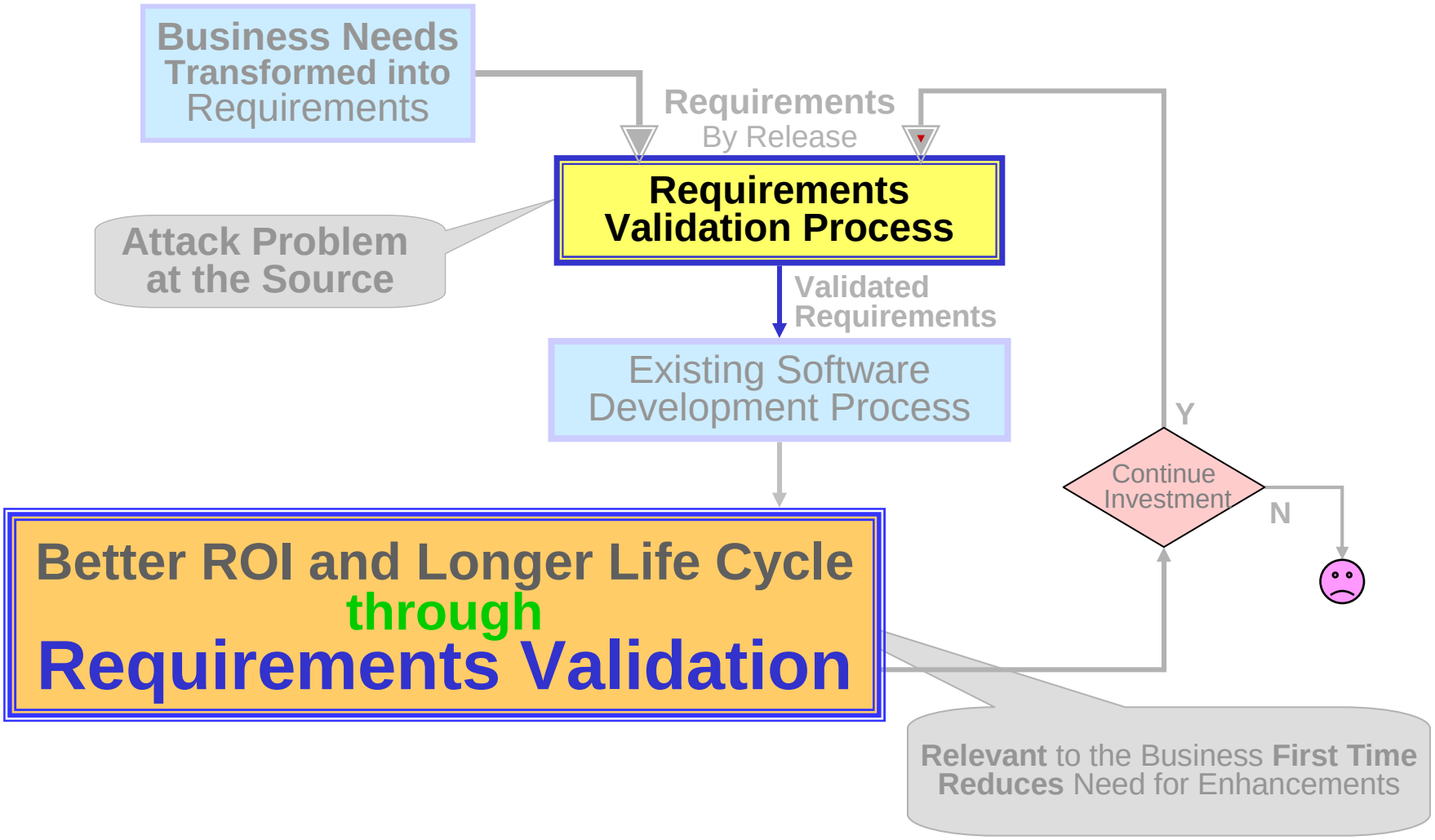
sente Corporation

- **Eliminated software bottlenecks** in the delivery of business solutions*, shifting the challenge from software development to change management.* Software releases are developed weekly and deployed monthly because of our limited ability to distribute changes effectively to over 1000 physically distributed users.
- **Improved delivery of *relevant* and *complete* solutions to center users** (in comparison to similar past projects):
  - **Software release cycle-times** increased by a factor of ***fifteen*** facilitating effective deployment of newly acquired operations-insight (e.g., weekly/daily releases).
  - **Software release cost** has been reduced by at least ***two orders of magnitude*** with a less than *18 month* ROI.
  - **Software release quality** has improved by a factor of ***fifty*** using field reported Severity 1 and 2 defects.
  - **Software release training interval** was reduced by ***at least two orders of magnitude*** *(e.g., to 4-8 hours)*
- **Enhanced center productivity at both the individual and team levels using throughput, cycle time and quality measurements:**
  - **Average Rep productivity** has increased by ***a factor of four***.
  - **Variance in Rep performance** within the same team was reduced by ***a factor of ten***.
  - **Create-Submit interval** for new customer orders was reduced by ***a factor of fifty****.*
- **Reduced significantly development feature churning** caused by incomplete requirements. In the past, without the validation process, development used business rules that were correct only one in seven (e.g., Megalink order).
- **Validated *real time and report based measurements*** to professionally manage center resources and to improve the team's process-maturity level.
- **Utilized change-management capabilities** that *preserve* the center's productivity during release deployments.

Summary – Requirements Validation

Improves Solution's Quality, Life Cycle and ROI

sente Corporation



sente Corporation

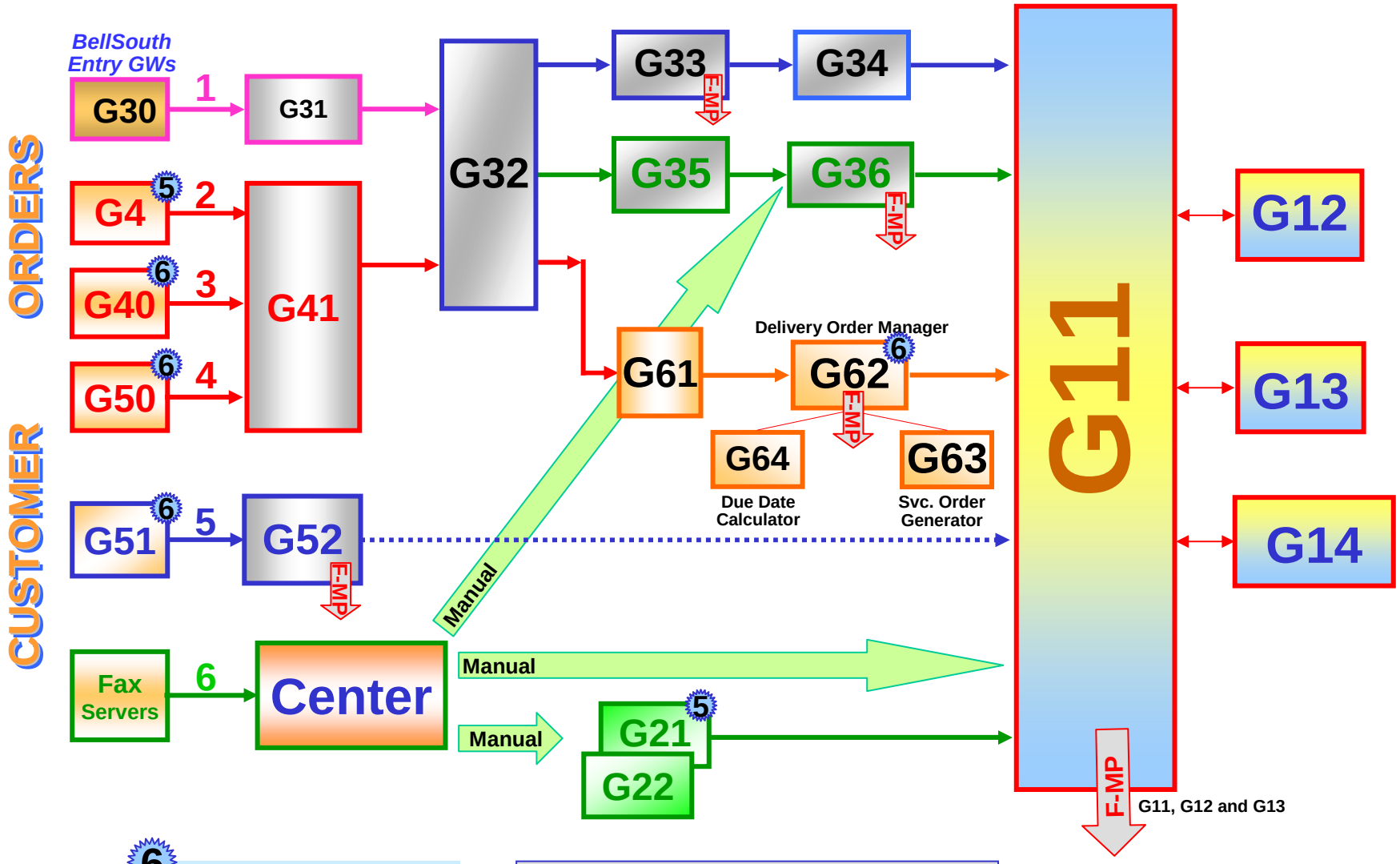
Backup Slides

System Architecture Evolution

The Objective: Effective Order Processing – Real Flow Through

(**RFLT Definition**: Electronic Processing of a Customer Order Delivered to G11)

sente Corporation



6 **FE Data Validation**
(S1, S2, S3, S4, G11, G12)

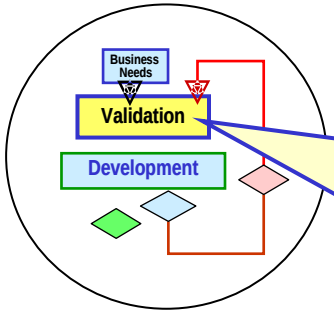
Software Bottleneck Solutions
- **Concurrent Development Teams**
- **Replicated System Functionality**
  - Developers are possessive of their code
  - The churning in functionality is killing the software

F-MP Fallout - Manual Processing

Key *eccm* Validation Capabilities

Six Key Areas

sente Corporation



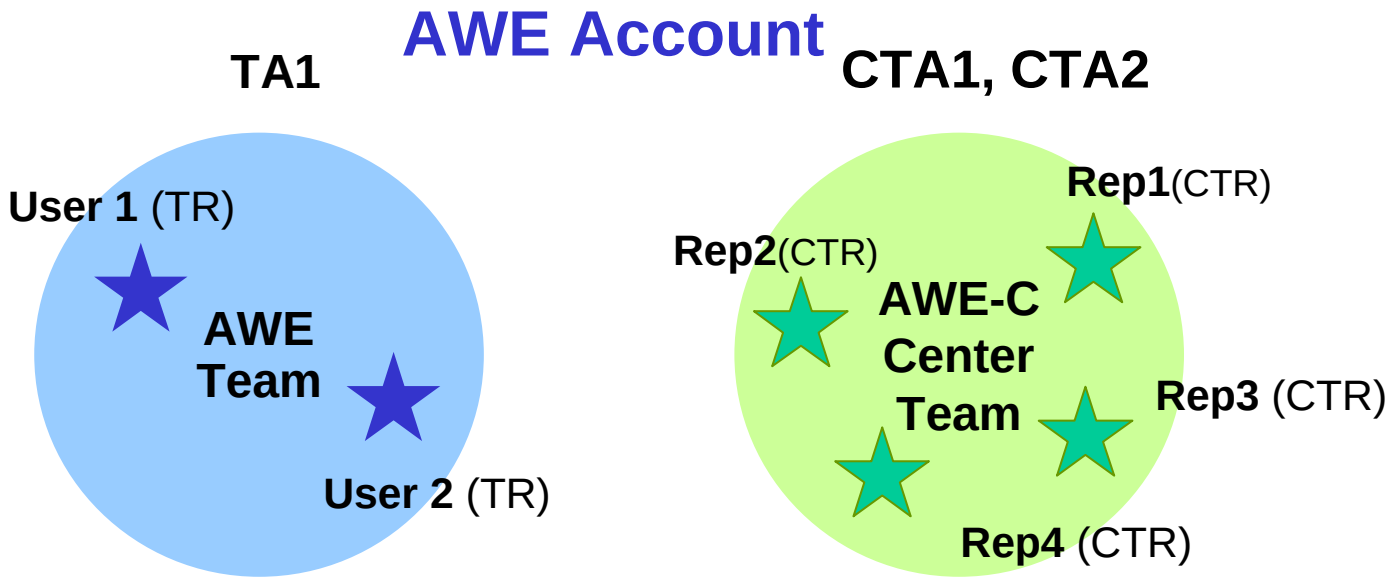
eccm
Release V. 28

- **Architecture**
  - cost effective implementation of learning cycles through daily/weekly SW releases
  - scalability (25, 100, 1000 users)
  - new-release related, center disruption-management (operational and trial versions concurrently in deployment)
  - integrated order management with clarify and escalation processing
  - incremental and targeted flow-thru automation
- **Configuration Management**
  - over 200 configurable options *without coding* (robust solution) (new product, fields, BRs, navigation, process definition, etc.)
  - customer and center collaborative order management
- **Easy Web Based UI and Training**
  - custom display and search functions
  - business-rules knowledge-based help function
  - supports all order transactions through a uniform user interface (intelligent edit filters)
  - context sensitive action buttons
  - integrated training and operational databases
  - management of Rep proficiency during training process
- **Business Rules (BRs)**
  - the development of a consistent baseline
  - the integration with the create/edit functions
  - the uniform application of BRs to all user activities (e.g., clarifies, escalations)
- **Operational Processes**
  - a rigorous 4-way definition and baseline
  - a table driven implementation
  - increased accountability through process transparency
- **Center Productivity Management**
  - Rep, team, and account level productivity, quality and throughput reports (real time, weekly, monthly)
  - session and order life cycle analysis
  - historical and cause analysis (reduce center load)
  - intelligent work list management

The *eccm* Toolkit
Delivers Cost Effectively
Business Solutions

Account Management - CM Capabilities

sente Corporation



SA - SA1, SA2, SA3

TA - team administrator
TR - team Rep

CTA - center team administrator
CTR - center team Rep

SA - system administrator

Real Time Process Monitoring - Orders

Rep Level Throughput and Quality Metrics

sente Corporation

Order Entry/Project Management

1. Orders (Rep View)

Process	Rep View	Admin View	Full View
Assign	0	0	2
Work	5 *	0	11 *
Status	2	0	5 *
Track	0	0	1
Done	1	0	1
Total	8	0	20

1 2 3

Integrated Historical Analysis (3/3)

Session ID, Action, Form Type and State Change Information

sente Corporation

User Session Details
(1/30/2001 11:48:47 AM)
Customer: Sprint

Ref #	Team	Team Rep	Sess Cnt	Sess ID	Action	Time	Form ID	Form Vsn	Form
1	Sprint	Bowers	1	16	Logon	11/16/2000 10:42:53 AM			
2	Sprint	Bowers	1	16	Logoff	11/16/2000 11:26:25 AM			
3	Sprint	Bowers	2	20	Logon	11/16/2000 3:11:59 PM			
4	Sprint	Bowers	2	20	Logoff	11/16/2000 3:21:38 PM			
5	Sprint	Bowers	3	29	Logon	11/17/2000 2:04:27 PM			
6	Sprint	Bowers	3	29	Logoff	11/17/2000 2:07:01 PM			
7	Sprint	Bowers	4	39	Logon	11/20/2000 11:06:07 AM			
9	Sprint	Bowers			Modified	11/20/2000 11:21:18 AM	3	1	Clarify
10	Sprint	Bowers			Modified	11/20/2000 11:30:42 AM	3	1	Clarify
11	Sprint	Bowers			AssignedBy	11/20/2000 11:31:00 AM	3	1	Clarify
12	Sprint	Bowers			AssignedTo	11/20/2000 11:31:00 AM	3	1	Clarify
13	Sprint	Bowers			Completed	11/20/2000 11:31:32 AM	3	1	Clarify
13	Sprint	Bowers	4	39	Logoff	11/20/2000 11:32:08 AM			
14	Sprint	Bowers	5	42	Logon	11/20/2000 1:29:47 PM			
15	Sprint	Bowers	5	42	Logoff	11/20/2000 2:07:31 PM			
16	Sprint	Bowers	6	49	Logon	11/21/2000 12:36:46 PM			
18	Sprint	Bowers			Created	11/21/2000 12:43:30 PM	5	1	Prem to Prem MEGALINK/Light/Plus (New/Supp)
19	Sprint	Bowers			Submitted	11/21/2000 1:00:19 PM	5	1	Prem to Prem MEGALINK/Light/Plus (New/Supp)
19	Sprint	Bowers	6	49	Timeout	11/21/2000 1:00:41 PM			
20	Sprint	Bowers	7	52	Logon	11/21/2000 1:30:14 PM			
21	Sprint	Bowers	7	52	Timeout	11/21/2000 1:59:10 PM			
22	Sprint	Bowers	8	55	Logon	11/21/2000 2:47:18 PM			
23	Sprint	Bowers	8	55	Drop	11/21/2000 2:47:22 PM			

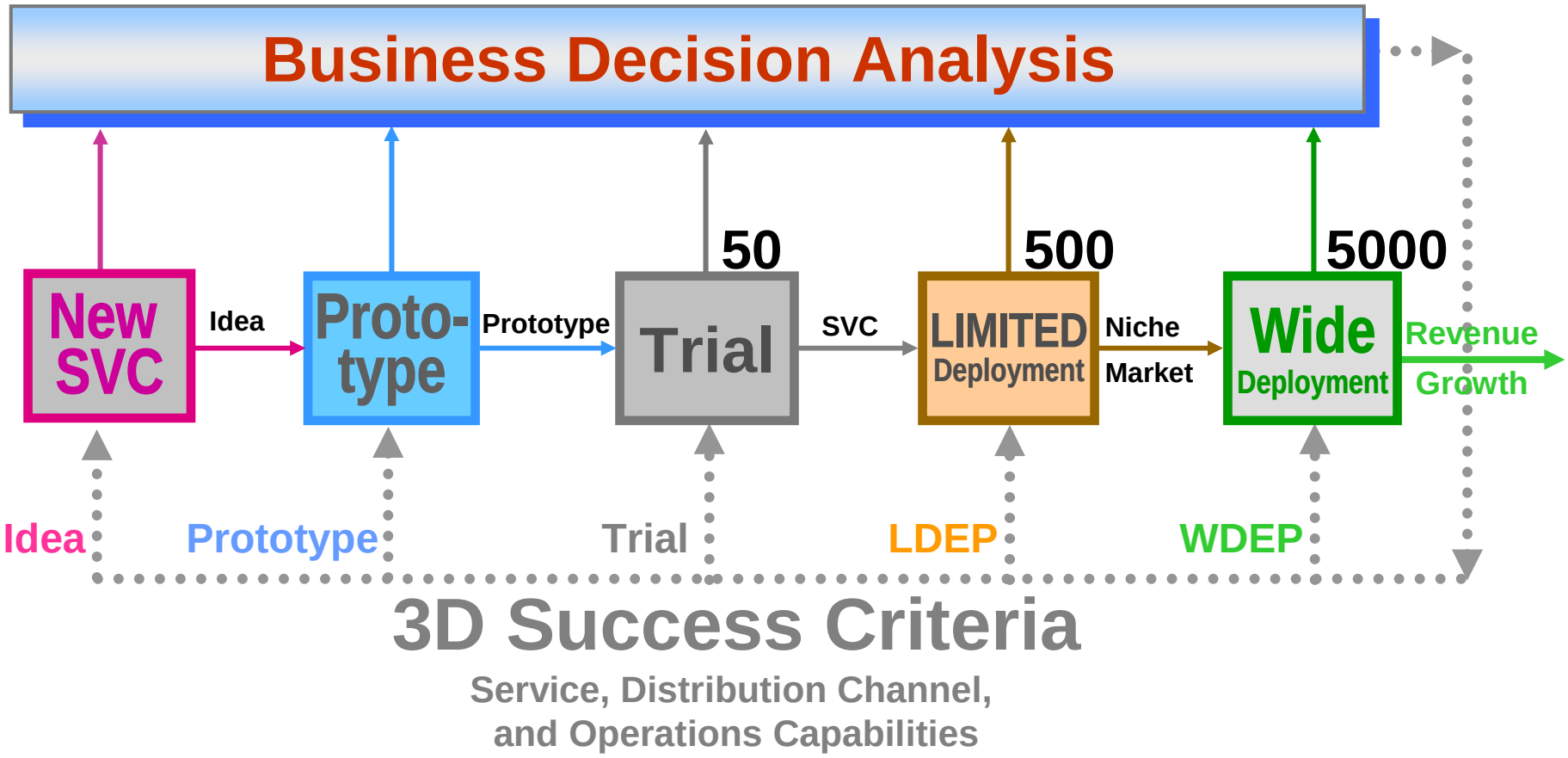
1

2

3

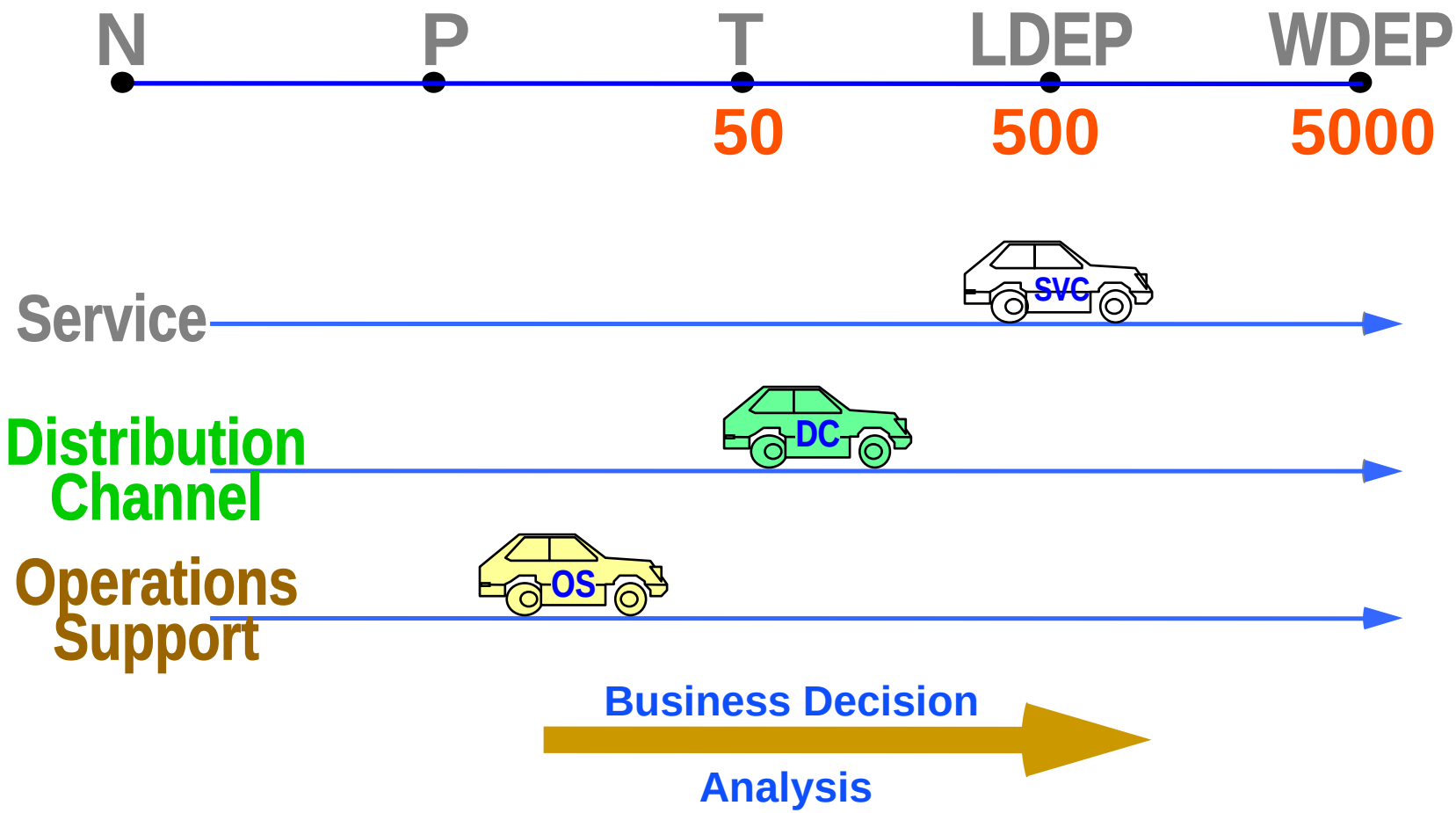
Define the Test so Everybody Gets an "A"
Business Knowledge Development

sente Corporation



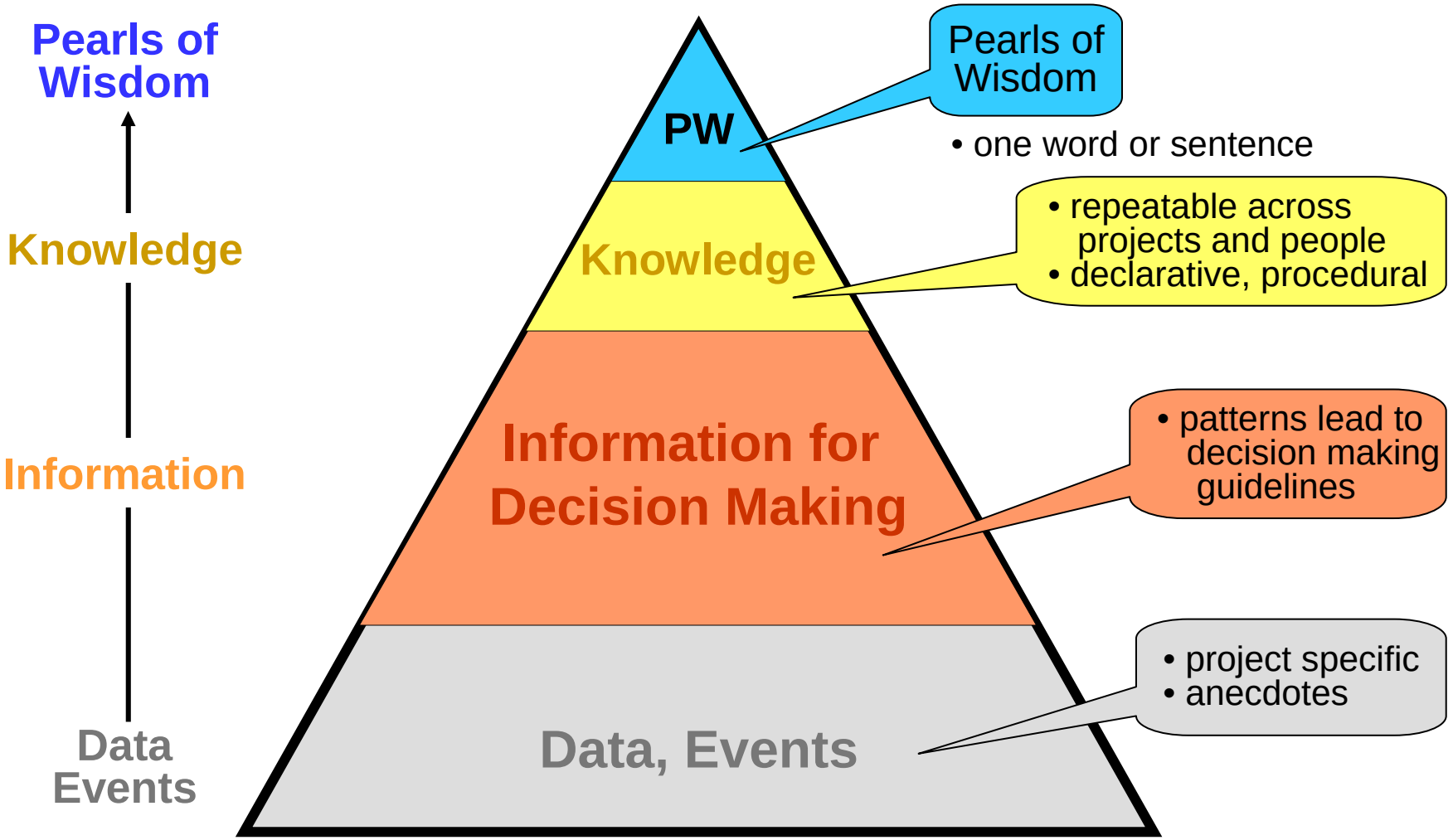
Concurrent Evolution of Capabilities
Service, Distribution Channel and Operations

sente Corporation



Insight Categories
by Knowledge Density

sente Corporation



Pearls of Wisdom

Summary

sente Corporation

- Do it **Predictably, Incrementally, and Faster**
  - Must Have Success Criteria - Get an "A"
    - Invest Incrementally in Line with Demand (#customers, users)
    - Operate in 3D (service, distribution channel, operations features)
  - Increase Influence of the Individual
  - Validate Requirements
- Do **Less**
  - Do not confuse motion with progress
- Do **Less with Software**
  - Give a Child a Hammer and *"everything will looks like a nail"* - give an IT organization an opportunity to contribute and "the solution will require software development"; everybody shifts solutions into their domain of expertise.
  - *There are always **effective** alternatives*
    - ***Think e-capabilities***
- All Re-engineering and Large Complex Projects are **"sold on fear"** and will **FAIL to Deliver ROI** (limited/**no** ROI on the investment)
- **Each Release that is Y months long will be late by X months**
  (e.g., **Y=12, X=6**; **(Y=6, X=2) (Y=3, X=0.5)**)

Last Slide