Application of Lean Six Sigma Methodology in Banking

Scotiabank,
International Banking,
International Operations and Shared Services

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AGENDA

- Lean Six Sigma Introduction
- Define Phase
- Measure Phase
- Analyze Phase
- Improve Phase
- Control Phase

- Information about Six Sigma Certification

- Questions

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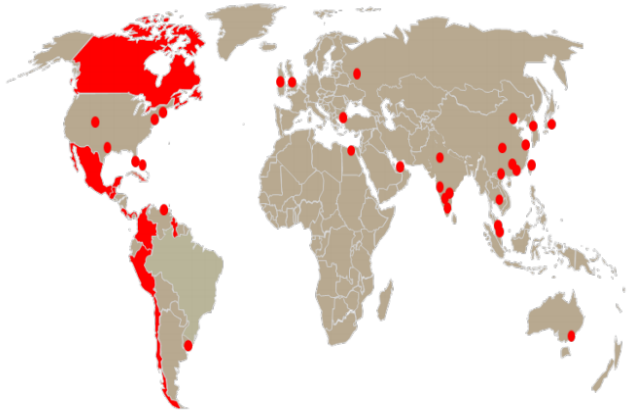
SCOTIABANK

Scotiabank – Canada's Most International Bank



As at Q3, 2014 (C$)	Scotiabank	Canadian Peer Rank [1]
Total Assets	$792B	3rd
Market Capitalization	$87B	3rd
Q3/14 Net Income [2]	$1.8B	3rd
ROE	20.6%	2nd
Productivity Ratio [2, 3]	52.9%	3rd
Capital Ratio [4]	10.9%	1st
Geographic Footprint	>55 countries	
# of Employees	86,949	

International Banking encompasses retail and commercial banking operations in 43 of the more than 55 countries outside Canada in which Scotiabank operates – an international presence unmatched by other Canadian banks. This business line has operations in Latin America, the Caribbean and Central America, and Asia. A full range of financial products, solutions, and advice is provided to over 14 million retail and commercial customers through a network of over 2,131 branches and offices, 4,748 ABMs (excluding affiliates), supplemented by additional products and services offered by Global Wealth & Insurance and Global Banking & Markets to meet customers' needs.

The Basic Six Sigma Metrics

In any process improvement endeavor, the ultimate objective is to make the process:

- **Better:** *DPU (defect per unit), DPMO (defects per million opportunities), variation reduction (less standard deviation)*
- **Faster:** *Cycle Time (reduce process time or product development time)*
- **Cheaper:** *COPQ (cost of product quality)*

The metrics for all Six Sigma projects fall into one of these three categories

Lean Six Sigma Introduction

ASQ Definition and Objectives

Six Sigma is a method for reducing variation in business processes, improving performance, and reducing costs. It was originally used in manufacturing, but now used in the service industry, especially banking and healthcare. Six Sigma projects measure the cost benefit of improving processes that are producing substandard products or services. Whether in manufacturing or service industries, such projects quantify the effect of process changes on delays or rework.

The goal of each successful Six Sigma project is to produce statistically significant improvements in the target process; over time, multiple Six Sigma projects produce end results that meet the objectives of excellent performance.

Sigma Level	Defects per Million Opportunities	Percent Defects	Percent Correct
Six	3.4	0.00%	100.00%
Five	230	0.02%	99.98%
Four	6,210	0.62%	99.38%
Three	66,800	6.68%	93.32%
Two	308,500	30.85%	69.62%
One	690,000	69.00%	31.00%

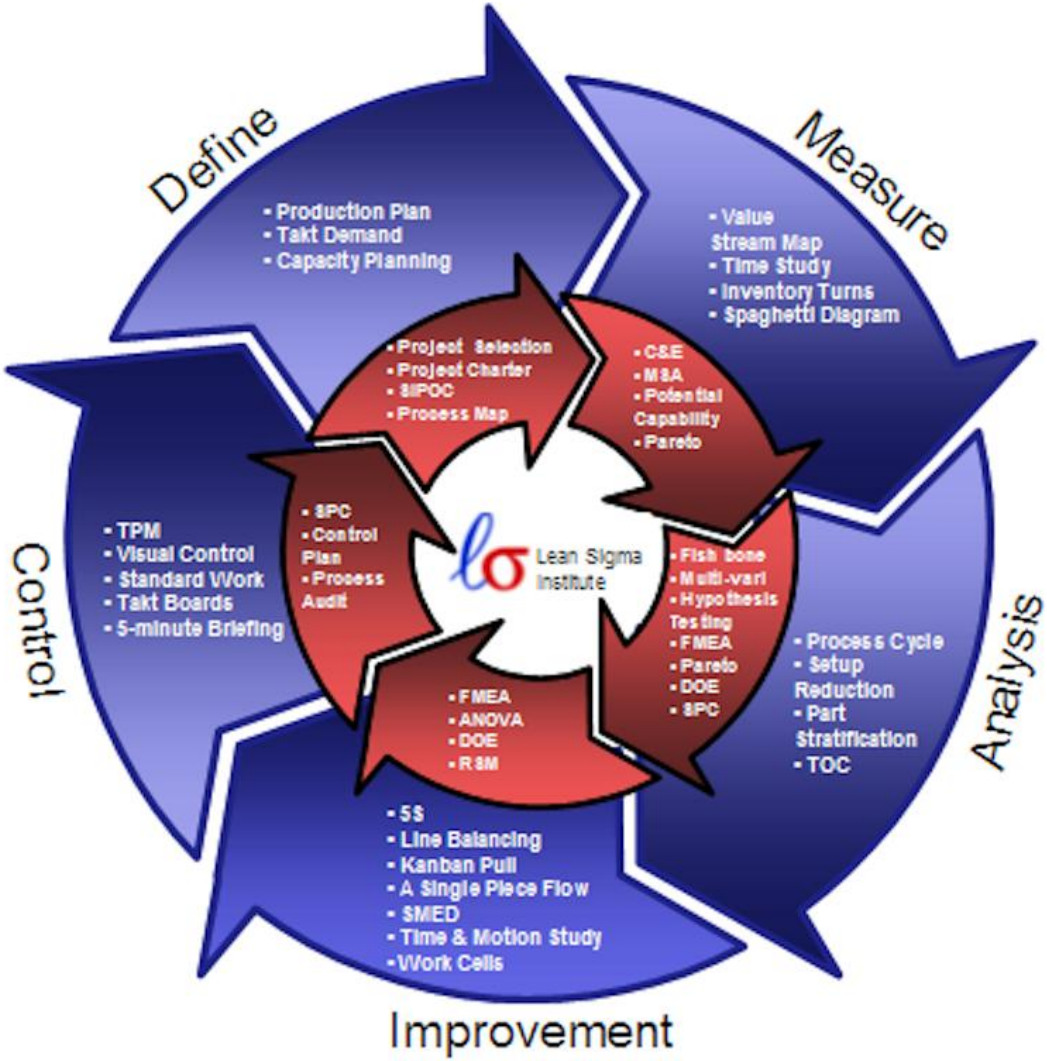
A six sigma process **means a process efficiency of 99.9997%**

DMAIC and Tools

Six Sigma System

Define	Measure	Analyze	Improve	Control
•Identify the important problems and select the project and scope •Define non-value added and determine the present status, the goal, and the gap	•Data collection plan •Measure as-is process capability through direct observations •Define the value stream map and identify factors such as process hurdles, touch points, approvals, and system issues	•Identify root causes •Identify vital few initial variables which are causing the problem, such as training, documentation, and system	•Develop solutions •Implement improvement plan •Redesign the value stream map and identify the new process capability through process flow chart.	•In the control phase, a robust control plan of risk management to prevent system failure is implemented, together with use of a control chart •Define the governance and sustainment of the improvement

Six Sigma Deployment Process



Define Phase:

What is the scope of the project;

What is the objective?

Define Phase

Retail E2E Project – Account Opening, SPL, and Mortgage Process Improvement

Objective:

To improve the customer experience and increase our ability to sell multiple products during a customer interaction, while increasing the proportion of time we spend selling

Specific Goals:

- Reduce the time it takes to make a sale (E2E time)
- Improve our cross-sell rate, appointment effectiveness
- Improve our customer conversion rate and loyalty
- Reduce admin time and down time
- Staff re-alignment
- Reduce rework
- Reduce and streamline documentation

What is a CTQ?

- Critical to Quality (CTQ ’s) are measures that we use to capture VOC properly. (also referred to in some literature as CTC’s – critical to customer)
- CTQ ’s can be vague and difficult to define.
  - The customer may identify a requirement that is difficult to measure directly so it will be necessary to break down what is meant by the customer into identifiable and measurable terms

Product:

- Performance
- Features
- Conformance
- Timeliness
- Reliability
- Serviceability
- Durability
- Aesthetics
- Reputation
- Completeness

Service:

- Competence
- Reliability
- Accuracy
- Timeliness
- Responsiveness
- Access
- Courtesy
- Communication
- Credibility
- Security
- Understanding

COPQ - Iceberg

Inspection

Warranty

Recode

Rework

Rejects

Visible Costs

(less obvious)

Engineering change orders

Time value of money

More Set-ups

Working Capital allocations

Hidden Costs

Lost Customer Loyalty

Lost sales

Late delivery

Expediting costs

Excess inventory

Long cycle times

Excessive Material Orders/Planning

Sample Transactional Severities

Effect	Criteria: Impact of Effect Defined	Ranking
Critical Business Unit-wide	May endanger company's ability to do business. Failure mode affects process operation and / or involves noncompliance with government regulation.	10
Critical Loss - Customer Specific	May endanger relationship with customer. Failure mode affects product delivered and/or customer relationship due to process failure and/or noncompliance with government regulation.	9
High	Major disruption to process/production down situation. Results in near 100% rework or an inability to process. Customer very dissatisfied.	7
Moderate	Moderate disruption to process. Results in some rework or an inability to process. Process is operable, but some work arounds are required. Customers experience dissatisfaction.	5
Low	Minor disruption to process. Process can be completed with workarounds or rework at the back end. Results in reduced level of performance. Defect is noticed and commented upon by customers.	3
Minor	Minor disruption to process. Process can be completed with workarounds or rework at the back end. Results in reduced level of performance. Defect noticed internally, but not externally.	2
None	No effect.	1

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COPQ – Hard and Soft Savings

While hard savings are always more desirable because they are easier to quantify, it is also necessary to think about soft savings.

COPQ – Hard Savings

- Labor Savings
- Cycle Time Improvements
- Scrap Reductions
- Hidden Factory Costs
- Inventory Carrying Cost

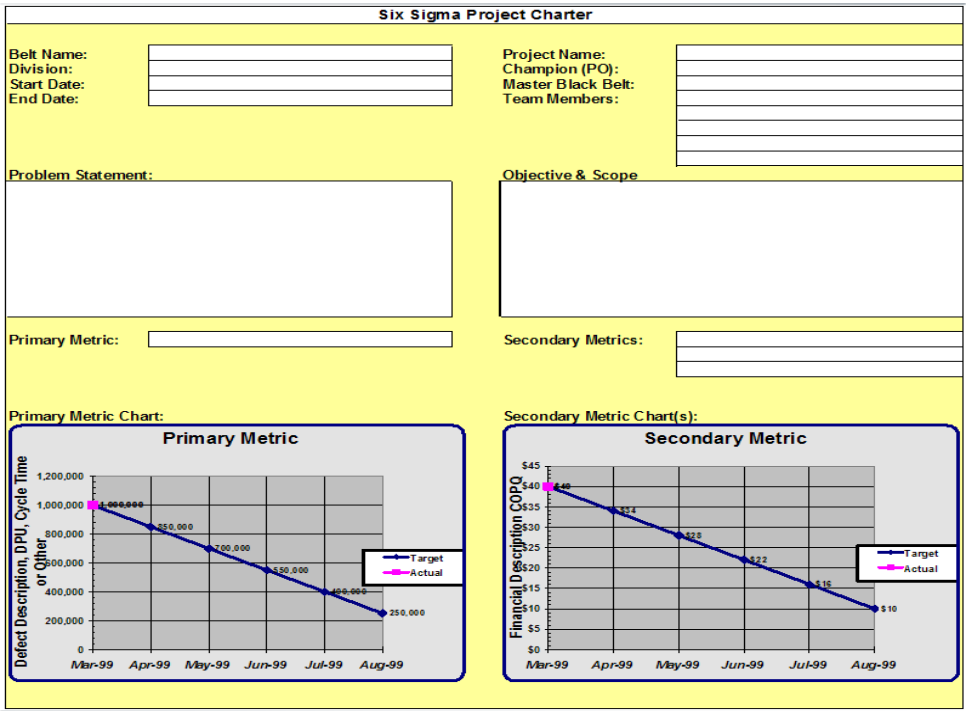
COPQ – Soft Savings

- Gaining Lost Sales
- Missed Opportunities
- Customer Loyalty
- Strategic Savings
- Preventing Regulatory Fines

What is a Project Charter?

The ***Project Charter*** expands on the Business Case, it clarifies the projects focus and measures of project performance and is completed by the Six Sigma Belt.

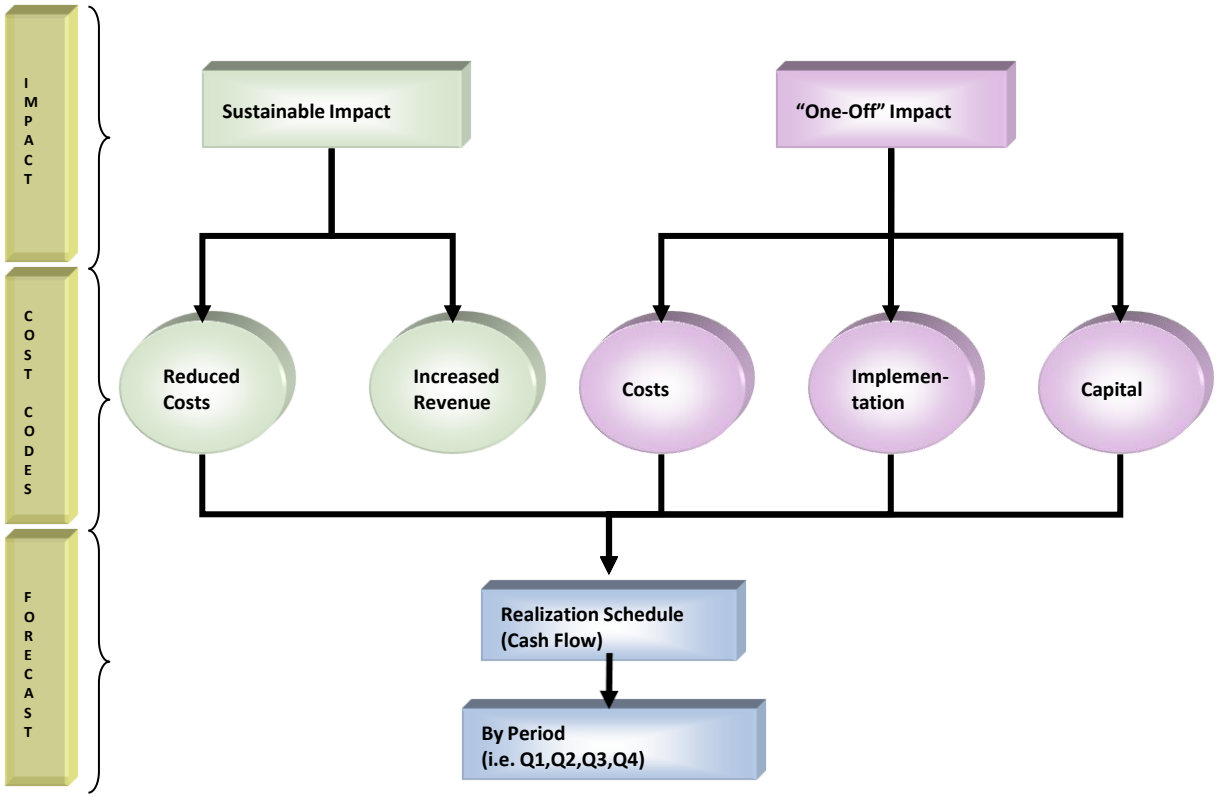
Components:



- The Problem
- Project Scope
- Project Metrics
  - Primary & Secondary
- Graphical Display of Project Metrics
  - Primary & Secondary
- Standard project information
  - Project, Belt & Process Owner names
  - Start date & desired End date
  - Division or Business Unit
  - Supporting Master Black Belt (Mentor)
  - Team Members

Benefits Capture - Calculation "Template"

Whatever your organization's protocol may be these aspects should be accounted for within any improvement project.



There are two types of Impact, One Off & Sustainable

Cost Codes allocate the impact to the appropriate area in the "Books"

Forecasts allow for proper management of projects and resources

Lean Six Sigma combines the strengths of each system:

- **Lean**
  - Guiding principles based operating system
  - Relentless elimination of all waste
  - Creation of process flow and demand pull
  - Resource optimization
  - Simple and visual

Strength: Efficiency

- **Six Sigma**
  - Focus on voice of the customer
  - Data and fact based decision making
  - Variation reduction to near perfection levels
  - Analytical and statistical rigor

Strength: Effectiveness

An Extremely Powerful Combination!

Waste does not add, subtract or otherwise modify the throughput in a way that is perceived by the customer to add value.

- In some cases, waste *may* be necessary, but should be recognized and explored:
  - Inspection, Correction, Waiting in suspense
  - Decision diamonds, by definition, are non-value added
- Often, waste can provide opportunities for additional defects to occur.
- We will discuss Lean in more detail later in the course.

Lean Enterprise
Seven Elements of Waste *

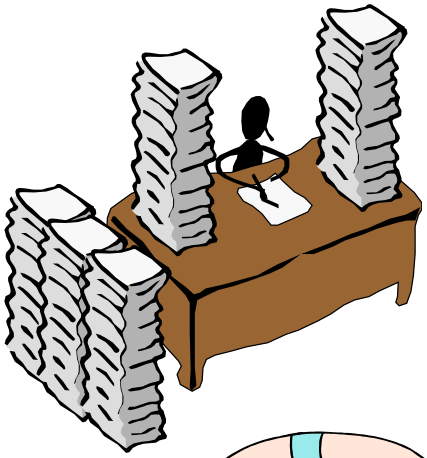
- Correction
- Processing
- Conveyance
- Motion
- Waiting
- Overproduction
- Inventory

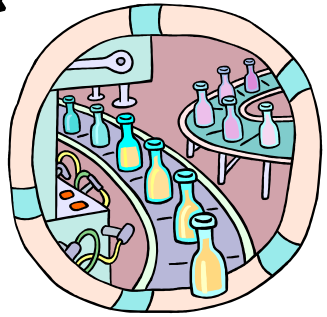
**Womack, J. P., & Jones, D. T. (1996). Lean Thinking. New York, NY: Simon & Schuster*

Overproduction

Overproduction **is producing more than the next step needs or more than the customer buys.**

- It may be the worst form of waste because it contributes to all the others.





Examples are:

- ✓**Preparing extra reports**
- ✓**Reports not acted upon or even read**
- ✓**Multiple copies in data storage**
- ✓**Over-ordering materials**
- ✓**Duplication of effort/reports**

Waste of Overproduction relates to the excessive accumulation of work-in-process (WIP) or finished goods inventory.

Correction

Correction **or defects are as obvious as they sound.**

Examples are:

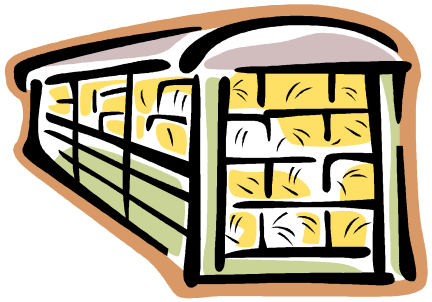
- ✓**Incorrect data entry**
- ✓**Paying the wrong vendor**
- ✓**Misspelled words in communications**
- ✓**Making bad product**
- ✓**Materials or labor discarded during production**

Eliminate erors!!

Waste of Correction includes the waste of handling and fixing mistakes. This is common in both manufacturing and transactional settings.

Inventory

Inventory **is the liability of materials that are bought, invested in and not immediately sold or used.**



Examples are:

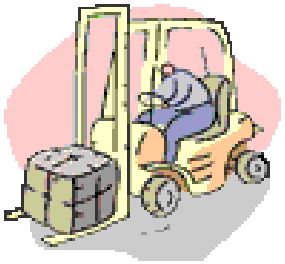
- ✓**Transactions not processed**
- ✓**Bigger "in box" than "out box"**
- ✓**Over-ordering materials consumed in-house**
- ✓**Over-ordering raw materials – just in case**

Waste of Inventory is identical to overproduction except that it refers to the waste of acquiring raw material before the exact moment that it is needed.

Motion

Motion **is the unnecessary movement of people and equipment.**

- This includes looking for things like documents or parts as well as movement that is straining.

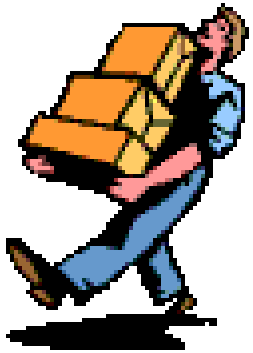


Examples are:

✓Extra steps

✓Extra data entry

✓Having to look for something



Waste of Motion examines how people move to ensure that value is added.

Overprocessing

Overprocessing **is tasks, activities and materials that don't add value.**

- Can be caused by poor product or tool design as well as from not understanding what the customer wants.

Waste of Overprocessing relates to over-processing anything that may not be adding value in the eyes of the customer.

Examples are:

✓Sign-offs

✓Reports that contain more information than the customer wants or needs

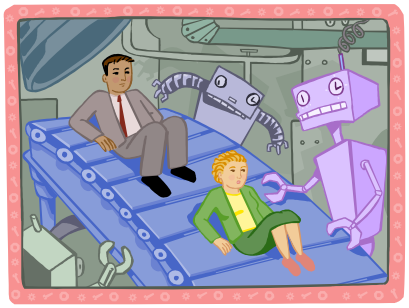
✓Communications, reports, emails, contracts, etc that contain more than the necessary points (briefer is better)

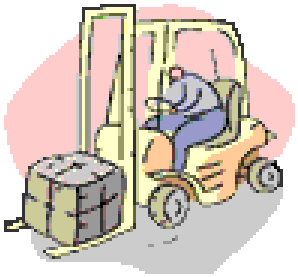
✓Voice mails that are too long

Conveyance

Conveyance **is the unnecessary movement of material and goods.**

- Steps in a process should be located close to each other so movement is minimized.





Examples are:

✓Extra steps in the process

✓Distance traveled

✓Moving paper from place to place

Waste of Conveyance is the movement of material.

Waiting

Waiting **is nonproductive time due to lack of material, people, or equipment**.

- Can be due to slow or broken machines, material not arriving on time, etc.

Examples are:

✓Processing once each month instead of as the work comes in

✓Showing up on time for a meeting that starts late

✓Delayed work due to lack of communication from another internal group

Waste of Waiting is the cost of an idle resource.

English Translation

There have been many attempts to force five English “S” words to maintain the original intent of 5S from Japanese. Listed below are typical English words used to translate:

1.) Sort (Seiri)
2.) Straighten or Systematically Arrange (Seiton)
3.) Shine or Spic and Span (Seiso)
4.) Standardize (Seiketsu)
5.) Sustain or Self-Discipline (Shitsuke)

Straighten

Place things in such a way that they can be easily reached whenever they are needed.

Sort

Identify necessary items and remove unnecessary ones, use time management.

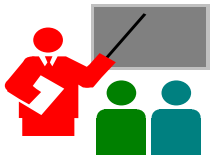
Shine

Visual sweep of areas, eliminate dirt, dust and scrap. Make workplace shine.

5 S

Self-Discipline

Make 5S strong in habit. Make problems appear and solve them.

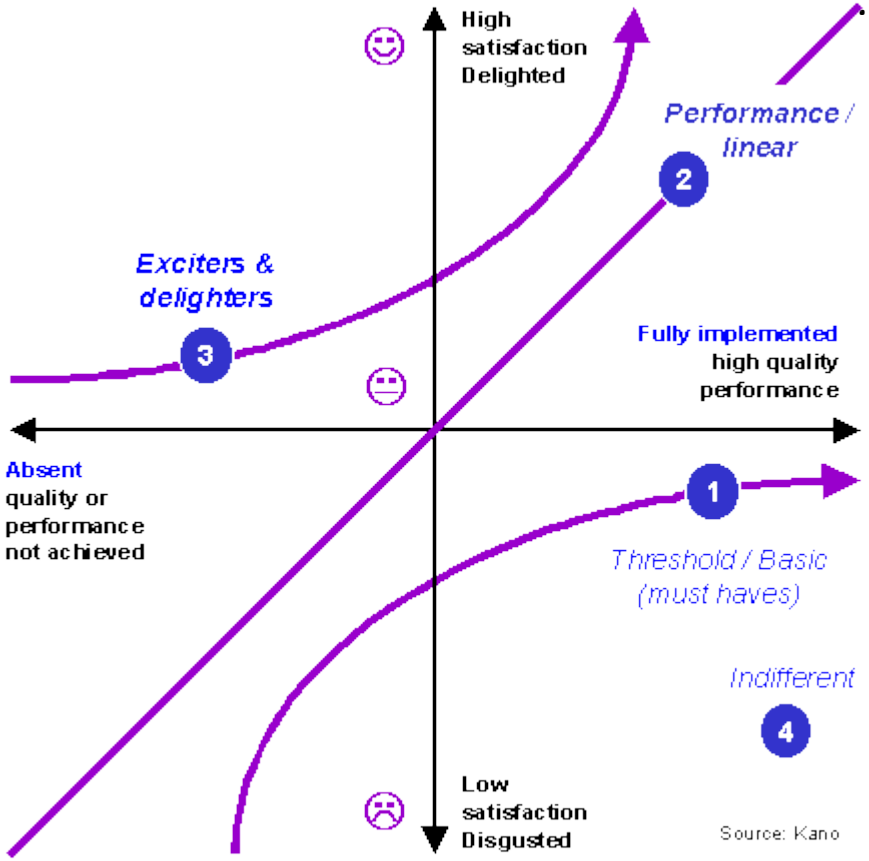


Standardize

Work to standards, maintain standards, wear safety equipment.

Kano Model

Example



Kano developed a relationship between customer satisfaction and quality. Kano pointed out that customer needs are complex and intricate and they are each related to customer satisfaction. Customers perceive some product attributes to contribute to their satisfaction more than others. Kano describes this relationship in a diagram.

Measure Phase:

What is the present status of the process?

Measure Phase

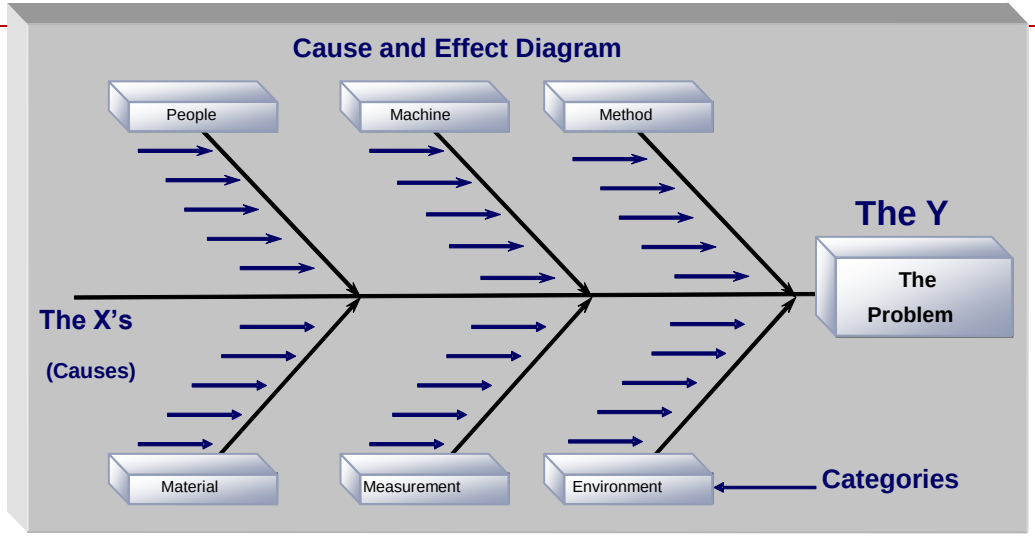
Sampling Methodology

Retail E2E Operating Model Design Team has been to 10 countries in the past 2.5 years, and spent 3-5 weeks in the country on each trip to gather data.

We visit 3 – 6 branches, undertake the following observations, around 200-300:

1. Job Shadow Personal Banking Officers/PBA – daily activities
2. Sales Observations – Does the sales conversation follow the sales roadmap?
3. Detailed Process Observations for account opening, SPL, Term Deposits, mortgage, and Scotialine, as defined by the country
4. Process flow diagram, spaghetti diagram, Rework data for applications & High Value Stream Map
5. Interviews with PBO, branch management, and LSU Officers
6. Systems observation – which aspects can be improved?
7. Labour Coverage – to see how busy the branch is on a typical day

Cause and Effect Diagram



A commonly used tool to solicit ideas by using categories to stimulate cause and effect relationship with a problem. It uses verbal inputs in a team environment.

Products

- Measurement
- People
- Method
- Materials
- Equipment
- Environment

Categories for the legs of the diagram can use templates for products or transactional symptoms. Or you can select the categories by process step or what you deem appropriate for the situation.

Transactional

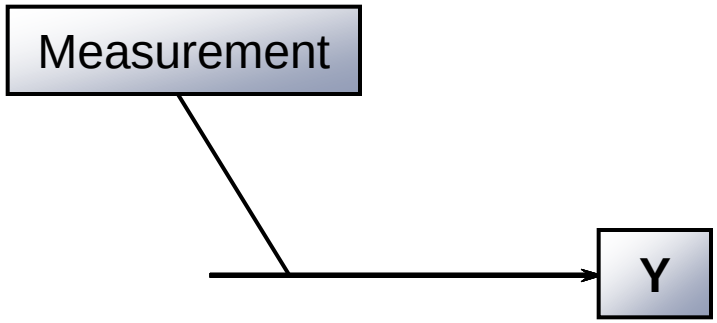
- People
- Policy
- Procedure
- Place
- Measurement
- Environment

Cause and Effect Diagram

The **Measurement** category groups causes related to the measurement and measuring of a process activity or output:

Examples of questions to ask:

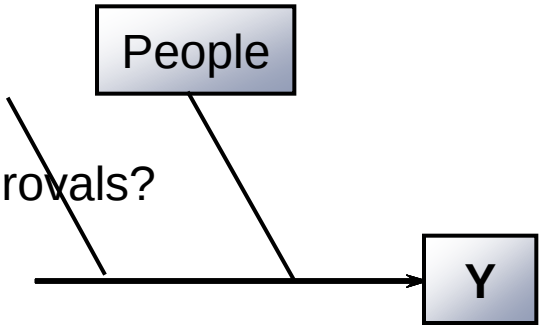
- Is there a metric issue? i.e. tracking the right information
- Is there a valid measurement system? Is the data good enough? i.e. SLA
- Is data readily available?



The **People** category groups root causes related to people, staffing, and organizations:

Examples of questions to ask:

- Are people trained, do they have the right skills or do we have a lot of approvals?
- Is there person to person variation? Or do people repeat the same tasks
- Are people over - worked?

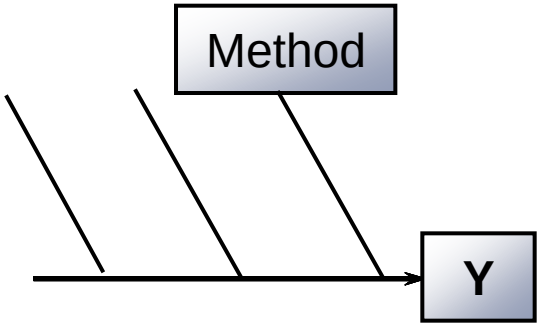


Cause and Effect Diagram

The **Method** category groups root causes related to how the work is done, the way the process is actually conducted:

Examples of questions to ask:

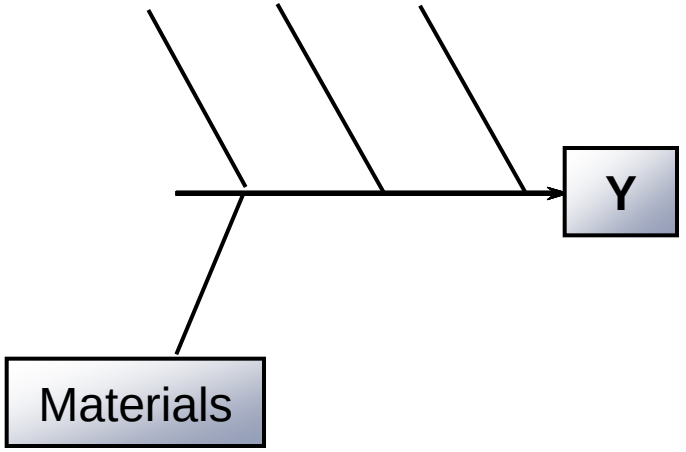
- How is this performed?
- Are procedures correct?
- What might be unusual?



The **Materials** category groups root causes related to parts, supplies, forms or information needed to execute a process:

Examples of questions to ask:

- Are policies current?
- Are parts or supplies obsolete or up to date marketing material ?
- Are there defects in the materials; partially system generated; partially filled in manually ?

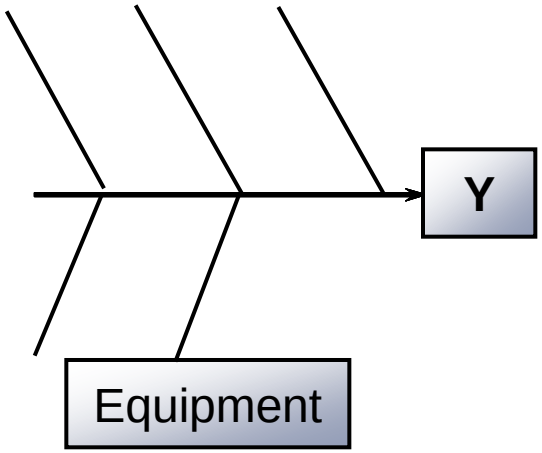


Cause and Effect Diagram

The **Equipment** category groups root causes related to tools used in the process:

Examples of questions to ask:

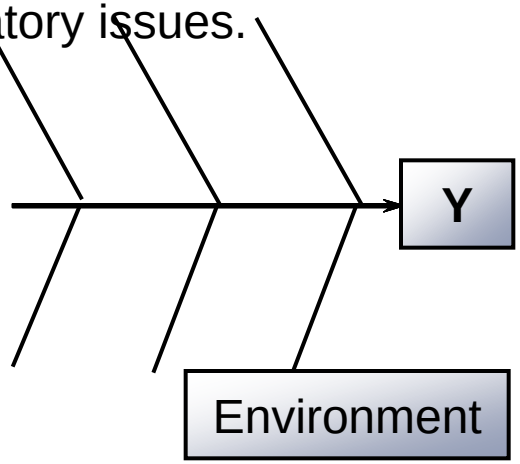
- Have machines been serviced recently, what is the uptime? E.g. card embosser
- Have tools been properly maintained?
- Is there variation? Do we have enough equipment i.e. easily accessed Card printer ?



The **Environment** (a.k.a. Mother Nature) category groups root causes related to our work environment, market conditions, and regulatory issues.

Examples of questions to ask:

- Is the workplace safe and comfortable?
- Are outside regulations impacting the business? Have we made sure that the regulations are being interperted properly not over kill
- Does the company culture aid the process?



Failure Mode Effects Analysis – Example from banking

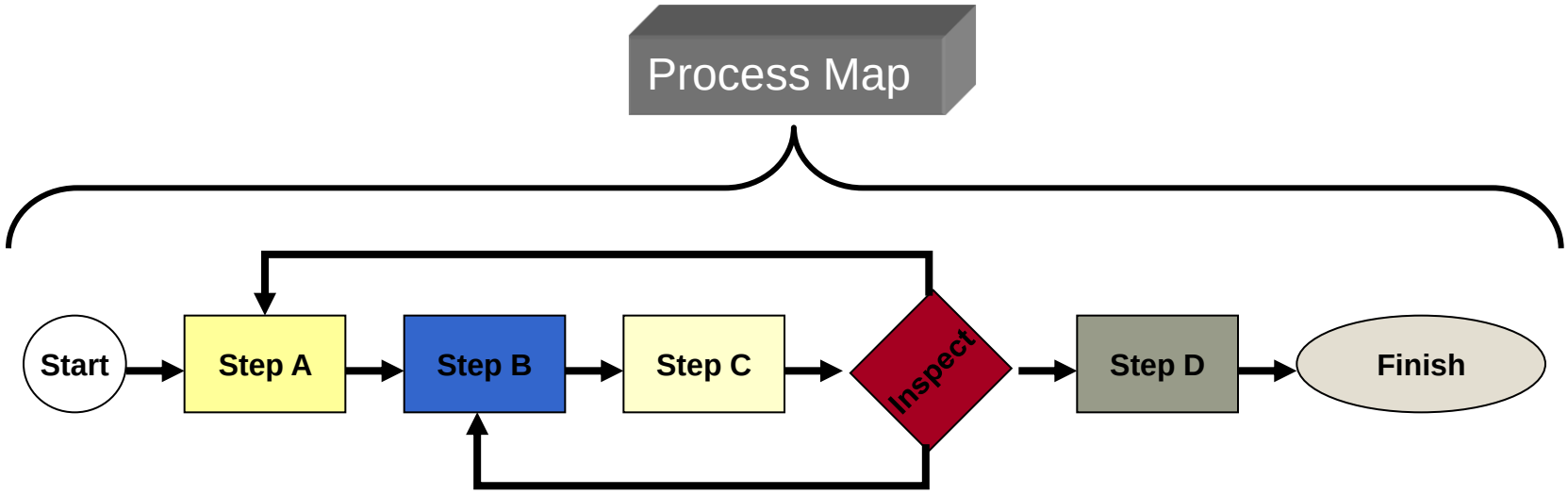
Process Step	Potential Failure Mode	Potential Failure Effect	SEV[1]	Potential Causes	OCC[2]	Current Process Controls	DET[3]	RPN[4]	Action Recommended
What is the step?	In what ways can the step go wrong?	What is the impact on the customer if the failure mode is not prevented or corrected?	How severe is the effect on the customer?	What causes the step to go wrong (i.e., how could the failure mode occur)?	How frequently is the cause likely to occur?	What are the existing controls that either prevent the failure mode from occurring or detect it should it occur?	How probable is detection of the failure mode or its cause?	Risk priority number calculated as SEV x OCC x DET	What are the actions for reducing the occurrence of the cause or for improving its detection? Provide actions on all high RPNs and on severity ratings of 9 or 10.
ATM Pin Authentication	Unauthorized access	• Unauthorized cash withdrawal • Very dissatisfied customer	8	Lost or stolen ATM card	3	Block ATM card after three failed authentication attempts	3	72	
	Authentication failure	Annoyed customer	3	Network failure	5	Install load balancer to distribute work-load across network links	5	75	
Dispense Cash	Cash not disbursed	Dissatisfied customer	7	ATM out of cash	7	Internal alert of low cash in ATM	4	196	Increase minimum cash threshold limit of heavily used ATMs to prevent out-of-cash instances
	Account debited but no cash disbursed	Very dissatisfied customer	8	• Transaction failure • Network issue	3	Install load balancer to distribute work-load across network links	4	96	
	Extra cash dispensed	Bank loses money	8	• Bills stuck to each other • Bills stacked incorrectly	2	Verification while loading cash in ATM	3	48	

1. **Severity**: Severity of impact of failure event. It is scored on a scale of 1 to 10. A high score is assigned to high-impact events while a low score is assigned to low-impact events.
2. **Occurrence**: Frequency of occurrence of failure event. It is scored on a scale of 1 to 10. A high score is assigned to frequently occurring events while events with low occurrence are assigned a low score.
3. **Detection**: Ability of process control to detect the occurrence of failure events. It is scored on a scale of 1 to 10. A failure event that can be easily detected by the process control is assigned a low score while a high score is assigned to an inconspicuous event.
4. **Risk priority number**: The overall risk score of an event. It is calculated by multiplying the scores for severity, occurrence and detection. An event with a high RPN demands immediate attention while events with lower RPNs are less risky.

Process Maps

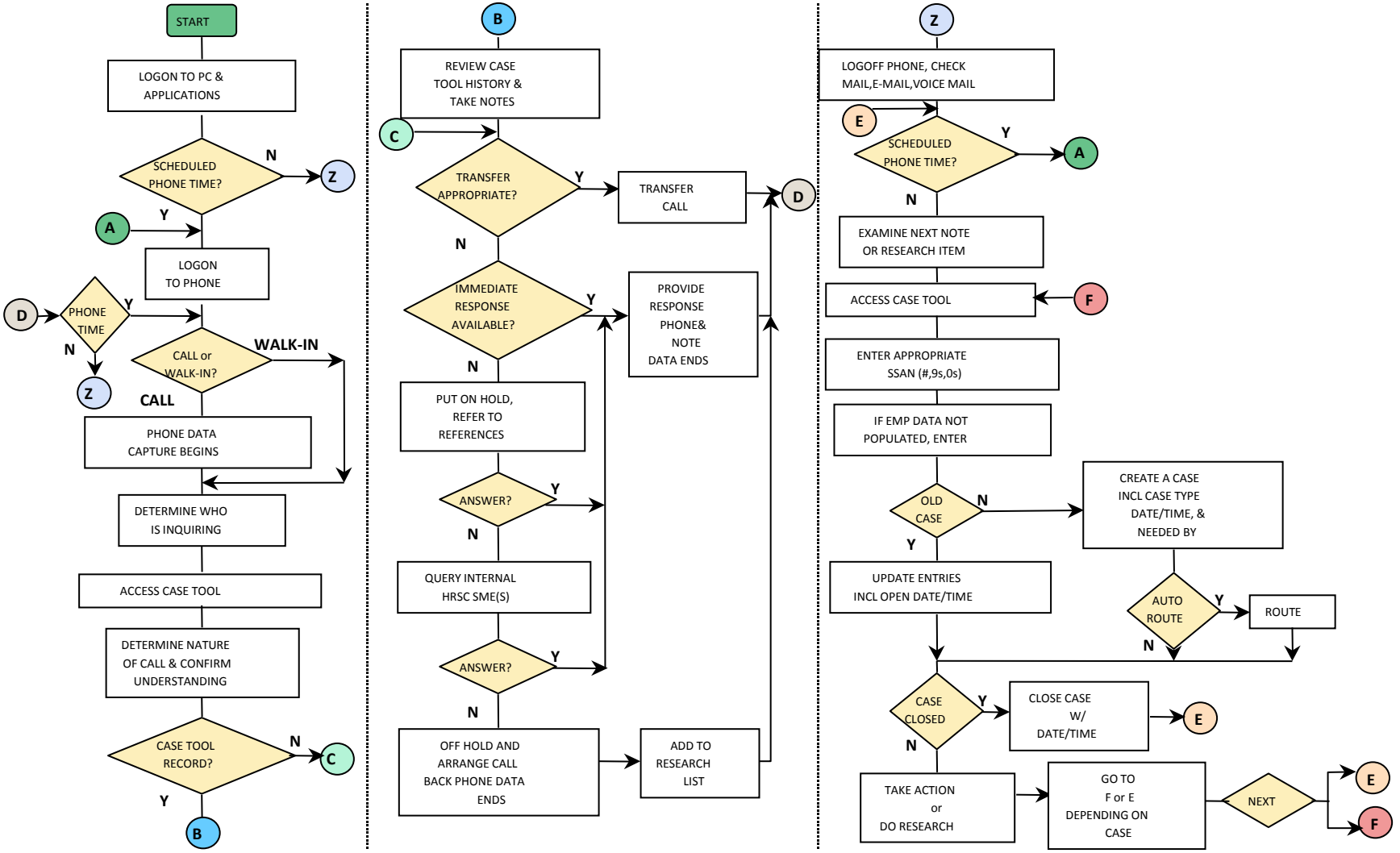
- The purpose of Process Maps is to:
  - Identify the complexity of the process
  - Communicate the focus of problem solving

- Process Maps are ***living*** documents and must be changed as the process is changed
  - They represent what is currently happening, not what you think is happening.
  - They should be created by the people who are closest to the process

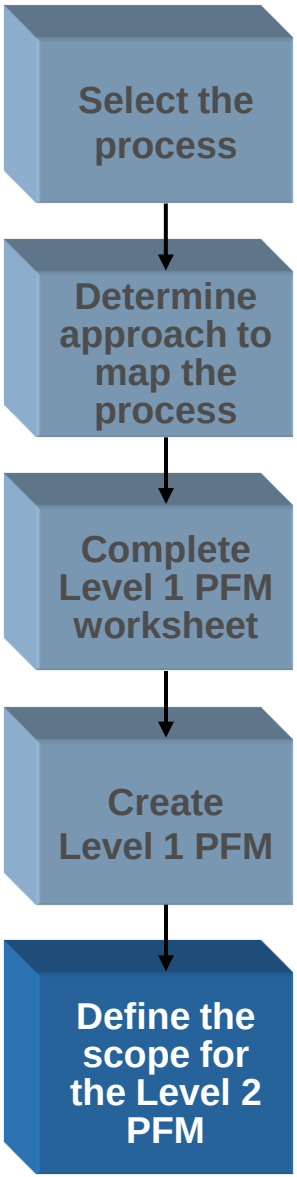


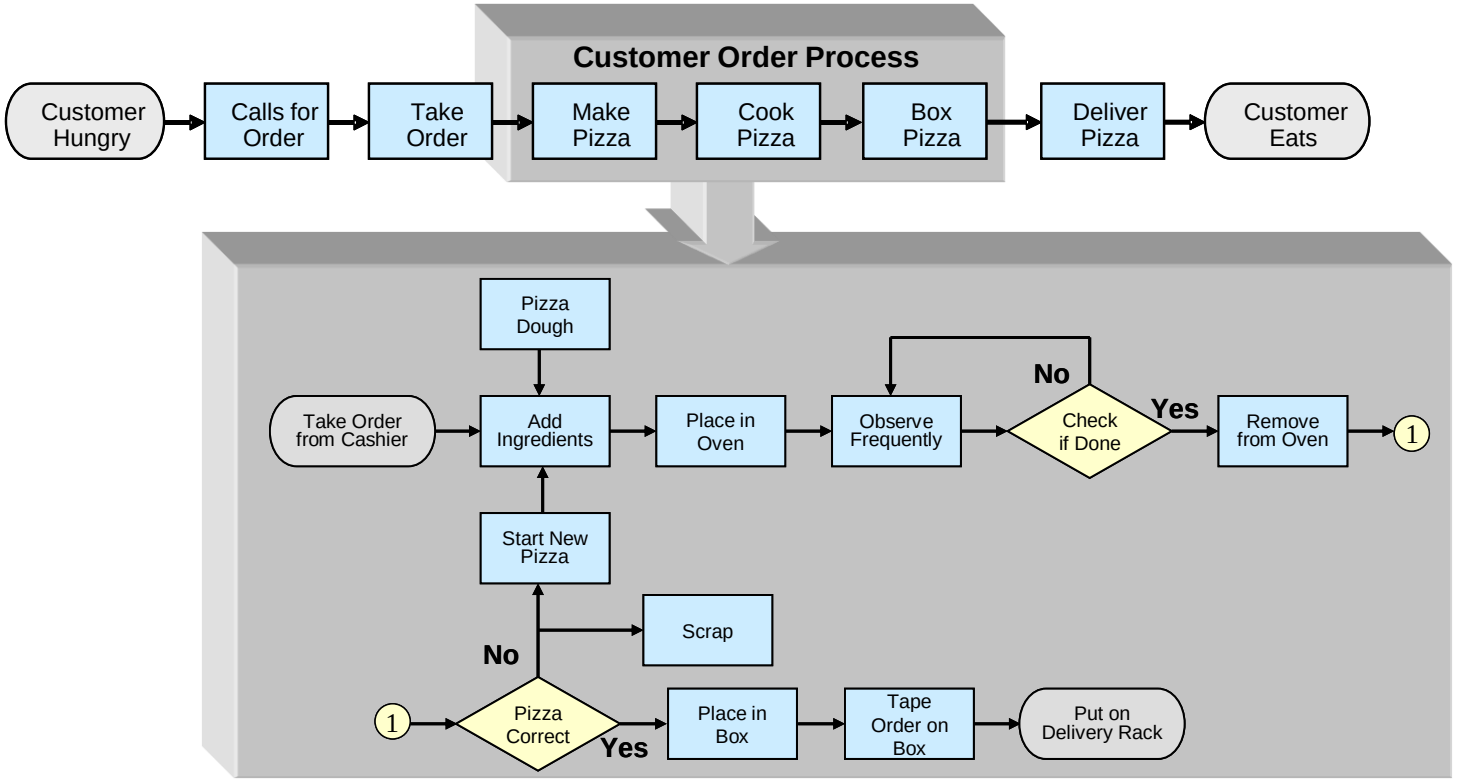
Process Map Example

The Process Map below is for a call center.



Defining the Scope of Level 2 PFM





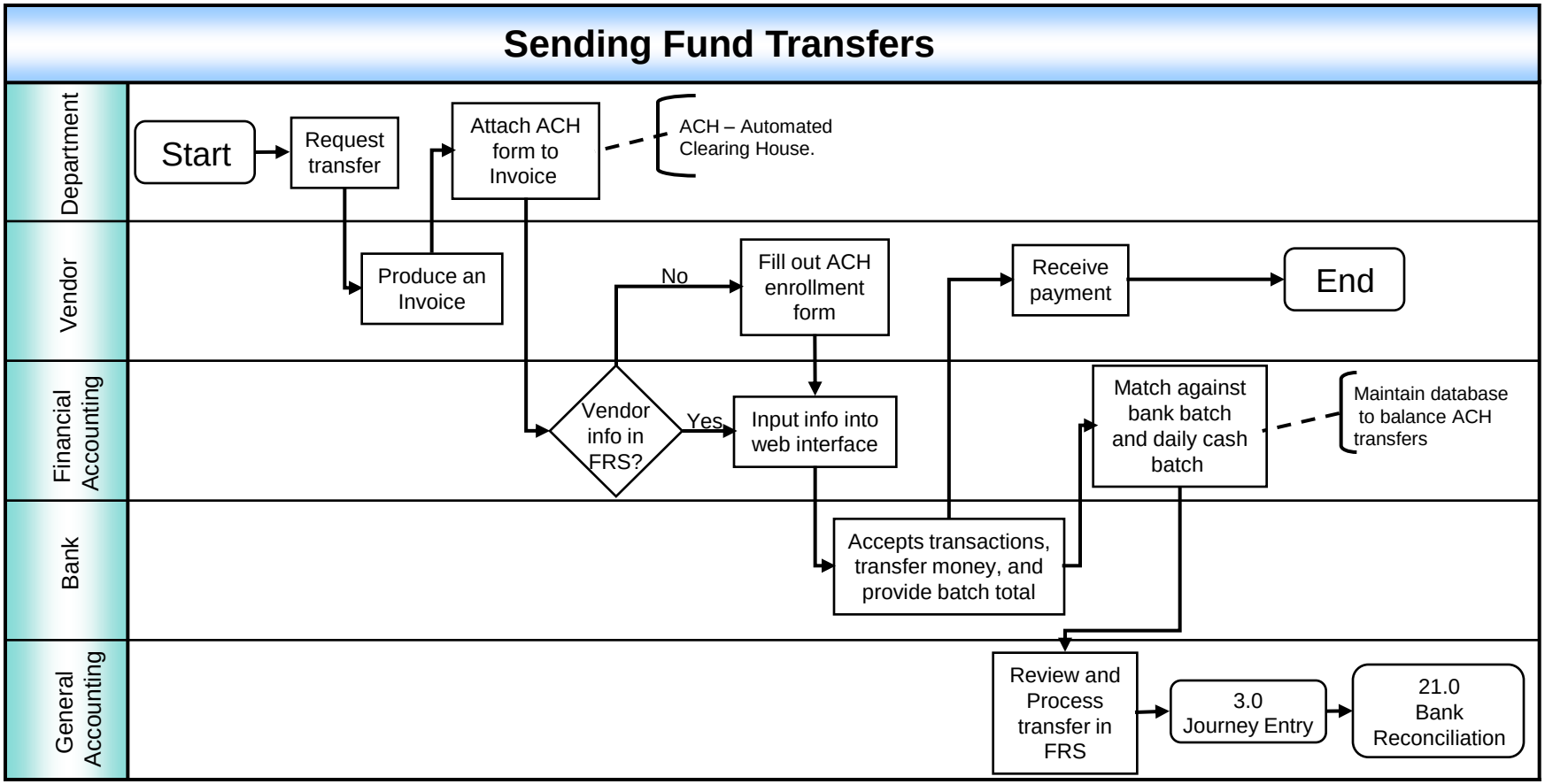
The rules for determining the Level 2 Process Map scope:

- From your Macro Process Map, select the area which represents your problem.
- Map this area at a Level 2.
- Start and end at natural starting and stopping points for a process, in other words you have the complete associated process.

Cross Functional Process Map

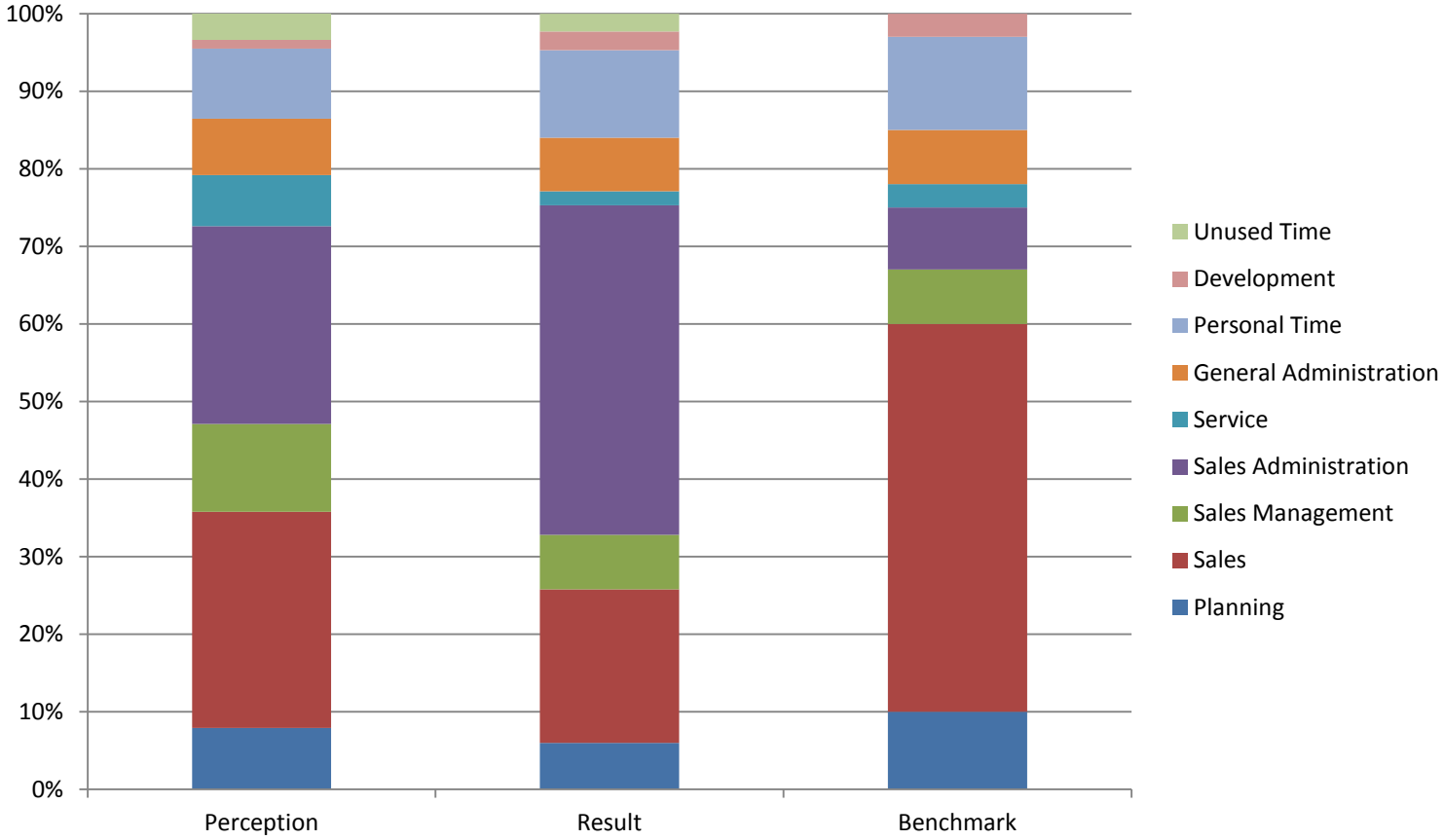
When multiple departments or functional groups are involved in a complex process it is often useful to use cross functional Process Maps.

- Draw in either vertical or horizontal swim lanes and label the functional groups and draw the Process Map



PBO Job Shadow Interview vs Shadow and Benchmark

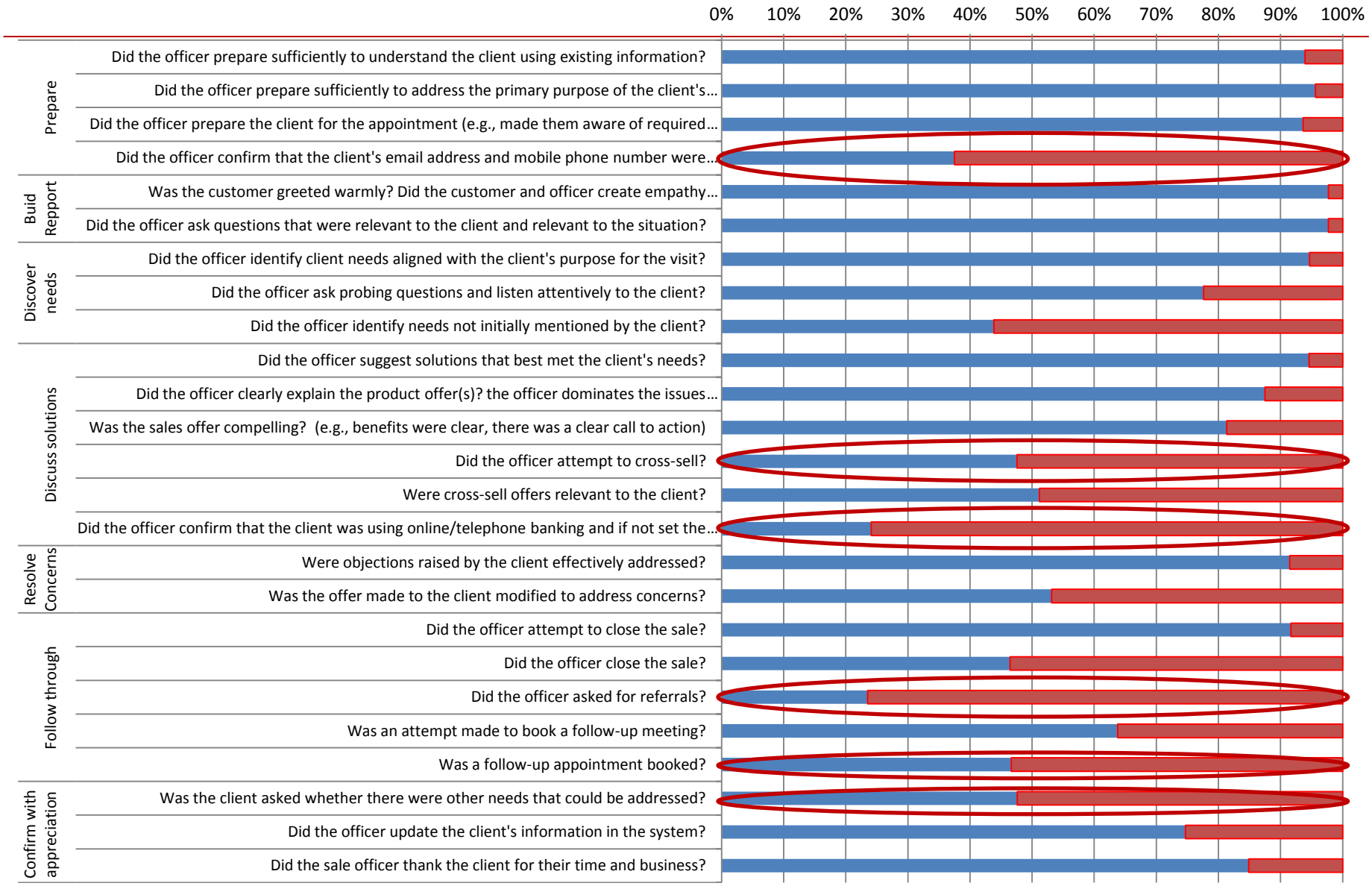
A sample of type of data output, compared to the benchmark.



Sales Administration activities take up 42% vs. a 8% benchmark time. If this load is reduced to a benchmark level, the freed up time can be used for sales

Note: Increased sales admin will be required to support additional sales

Sample of Sales Observations PBOs



39

Analyze Phase:

What are the factors that can improve the process?

The 80:20 Rule Examples

20% of the time expended produced 80% of the results

80% of your phone calls go to 20% of the names on your list

20% of the streets handle 80% of the traffic

80% of the meals in a restaurant come from 20% of the menu

20% of the paper has 80% of the news

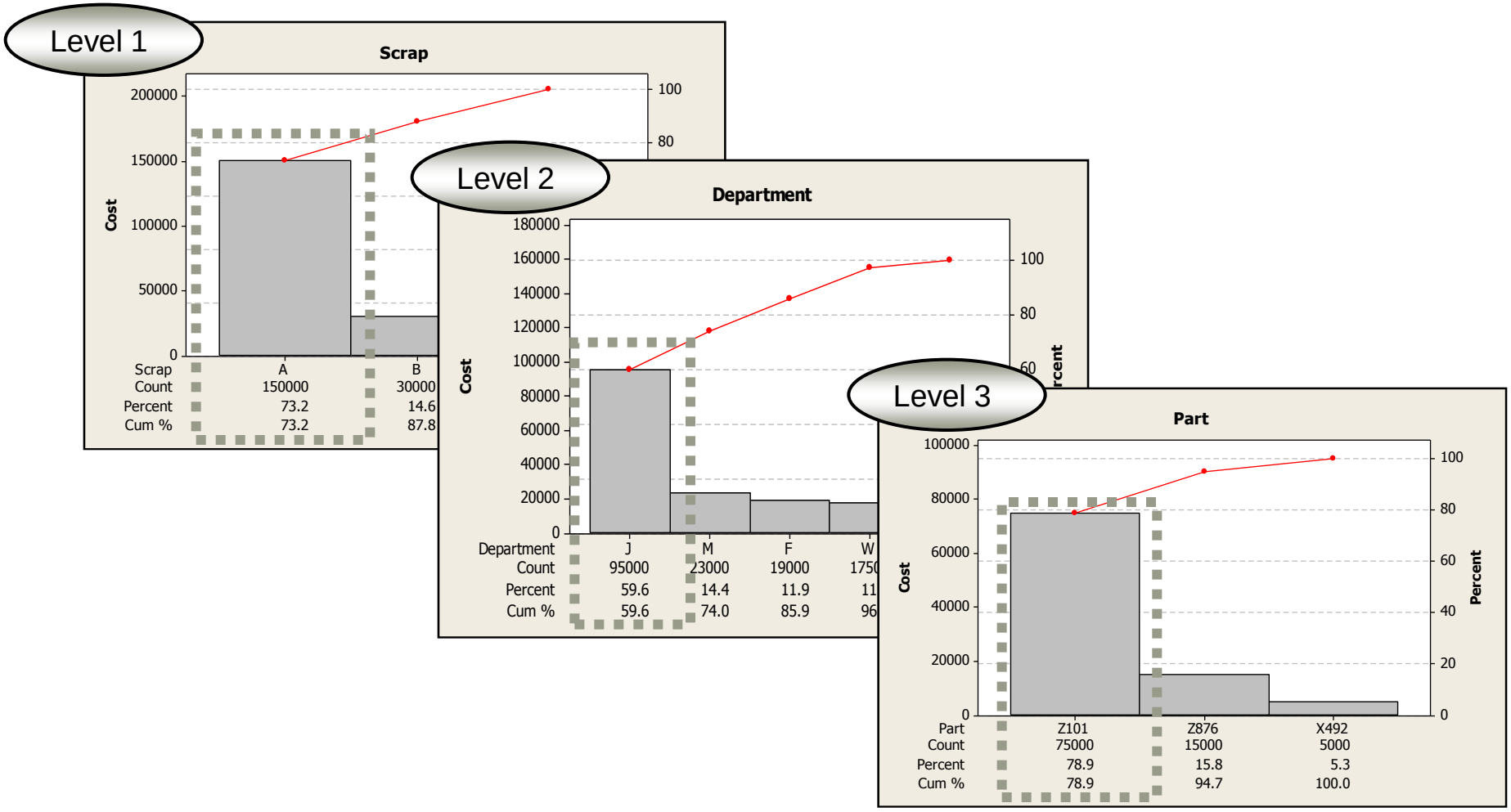
80% of the news is in the first 20% of the article

20% of the people cause 80% of the problems

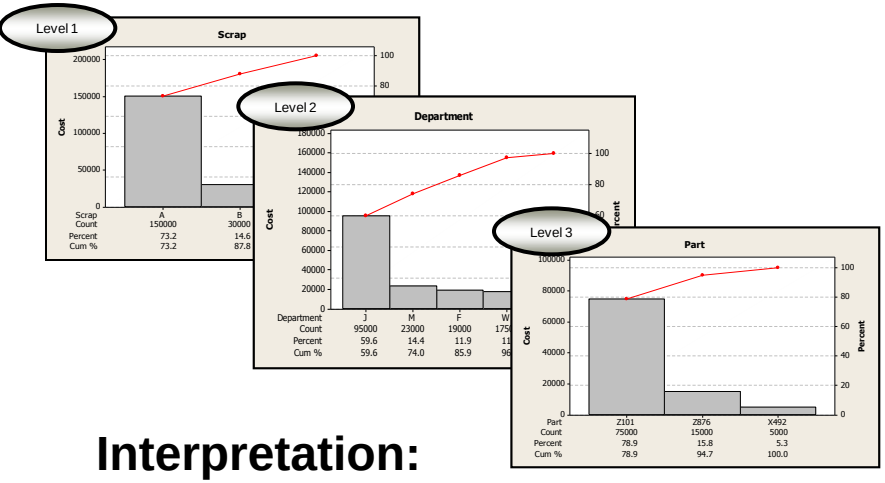
20% of the features of an application are used 80% of the time

Pareto Chart - Tool

Multi level Pareto charts are used in a drill down fashion to get to root cause of the tallest bar.



Pareto Chart - Tool



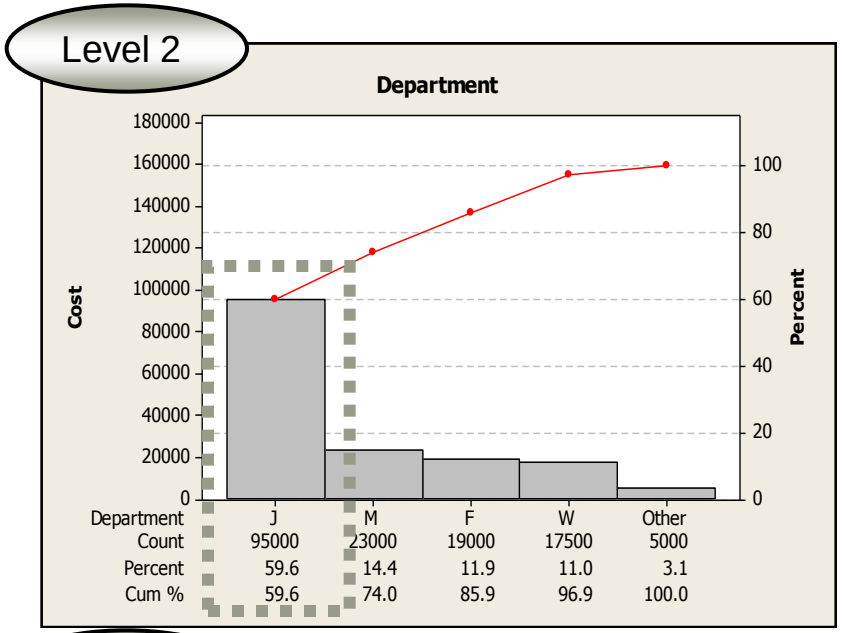
Interpretation:

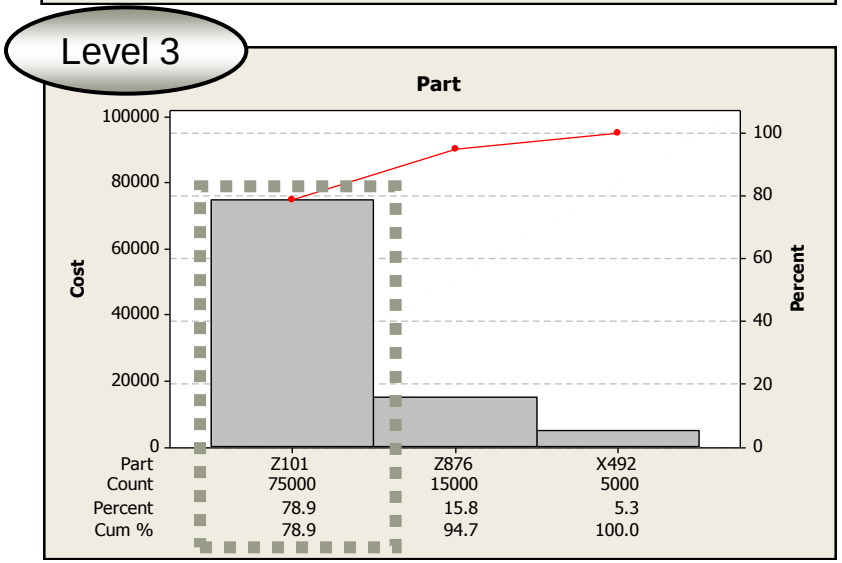
Level 1:

- Department J Makes up 60% of the Scrap

Level 2:

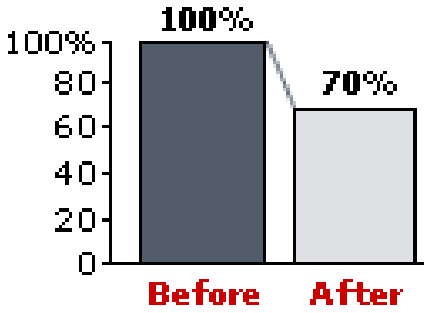
- Part Z101 Makes up 80% of Department J's Scrap





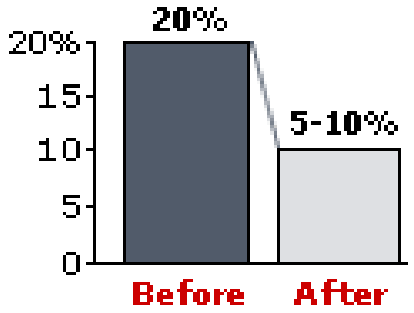
Example of Process Improvement in banking

Faster customer response time



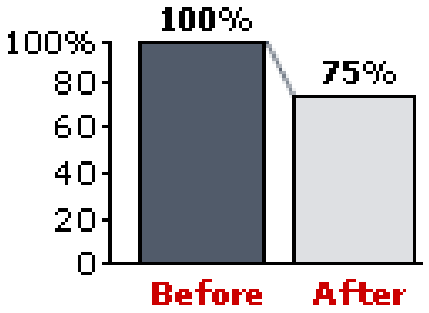
- 30% reduction in time required to approve credit applications (with fast track deals)

More delegation to front line



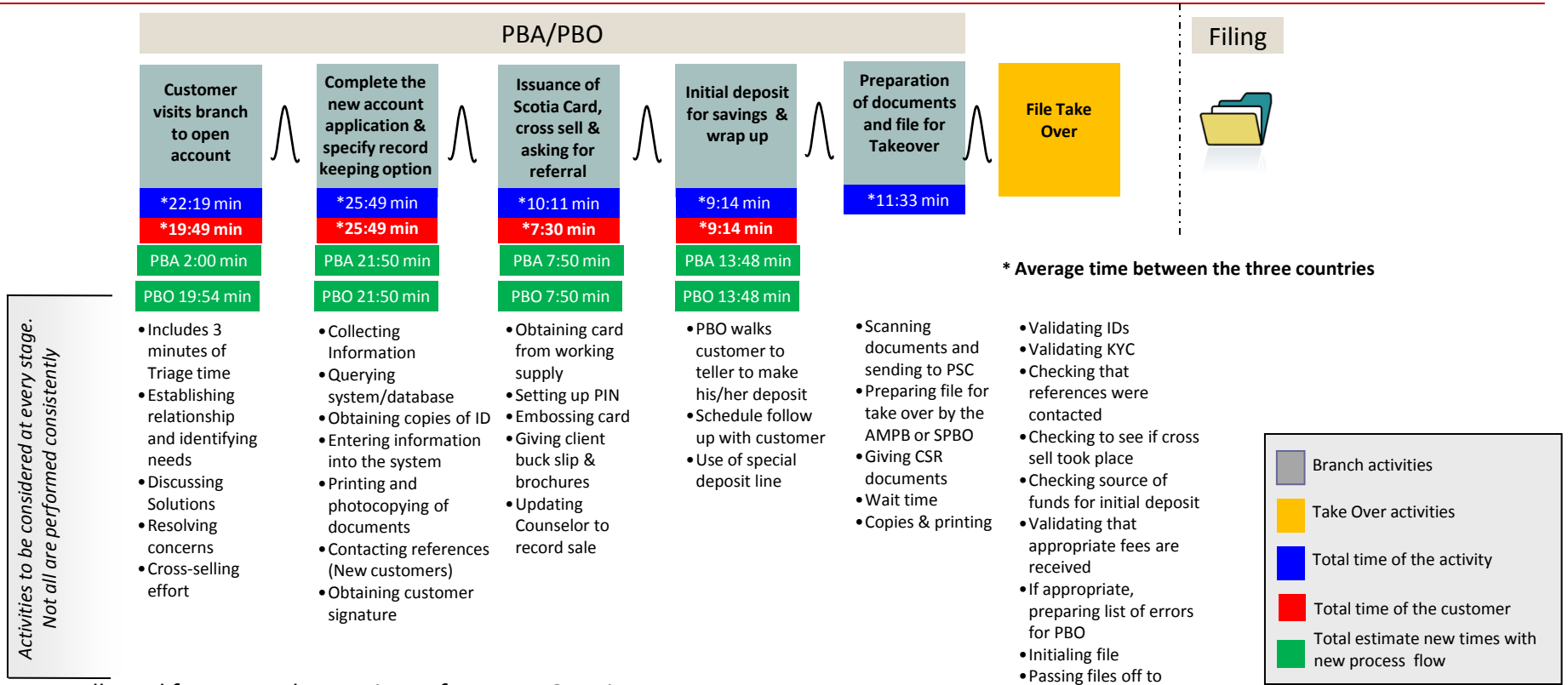
- 10-15% reduction of deals requiring approval by central credit head
- Most smaller applications approved regionally

Improved accuracy



- 25% reduction in applications requiring rework

High Level Value Stream Map with Estimated New Timings
Account Opening



Data collected from 144 observations of Account Opening

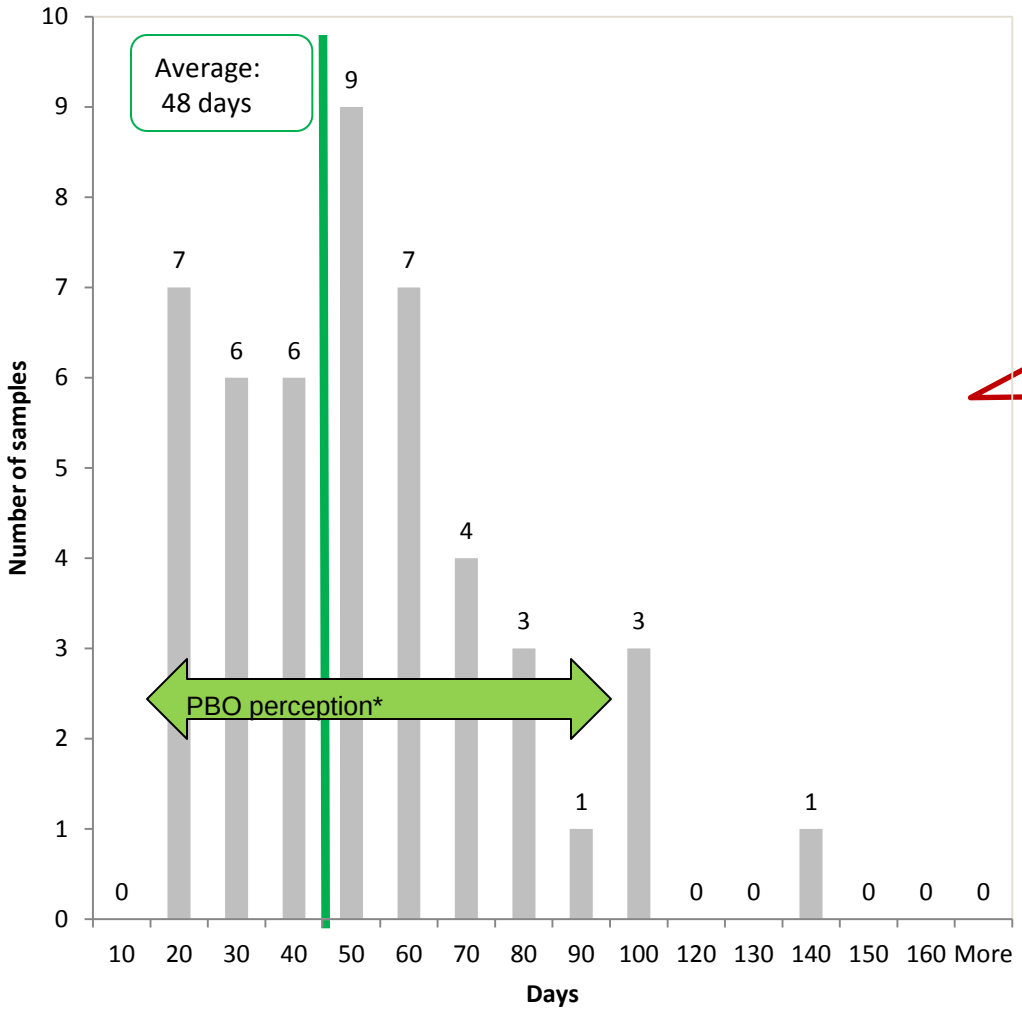
PBA/PBO	Country A	Country B	Country C	PBA New Time	PBO New Time
Customer time at the branch:	1 hr 14 min	0 hr 57 min	0 hr 56 min	0 hr 45 min	1 hr 03 min
Time at the branch review/approval:	21 min	10 min	17 min	0 min	0 min
Total time at the branch:	**1 hr 36 min**	**1 hr 07 min**	**1 hr 13 min**	**0 hr 45 min**	**1 hr 03 min**
Time at the branch for take over:	9 min	8 min	3 min	0 min	0 min
Total E2E Account Opening Time:	**1 hr 45 min**	**1 hr 15 min**	**1 hr 16 min**	**0 hr 45 min**	**1 hr 03 min**

Improve Phase:

What can we implement, and what is the impact?

Current Mortgage Model: Average Time from Index to Funding

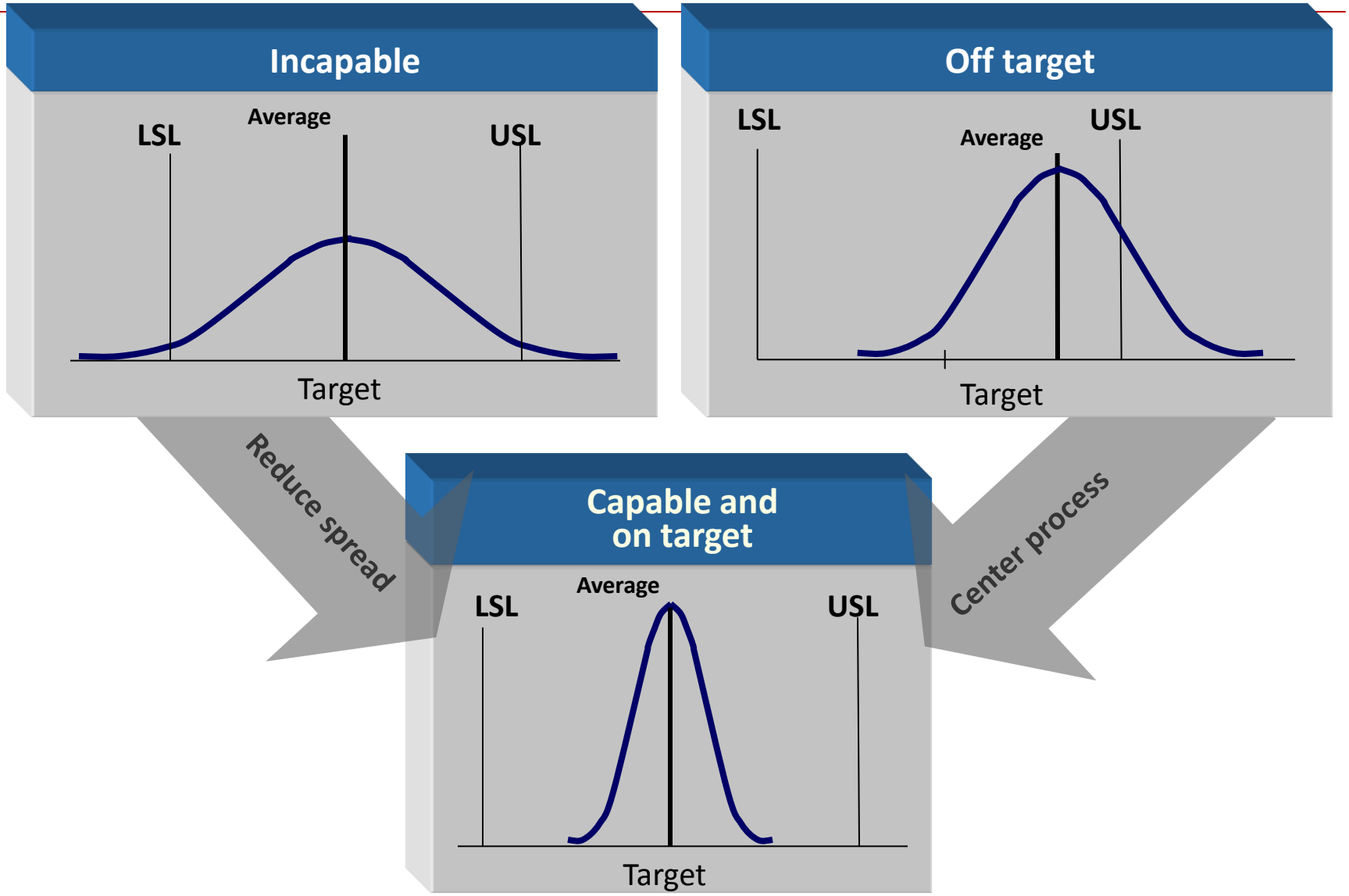
- 47 funded new purchase mortgages were analyzed in order to determine the end to end time



- **Average days from customer application to funding is 48 days.**
- **Range was from 11 days to 139 days**
- ***Interviews of 5 PBOs and 2 ROs indicated a perception that mortgages take 11 days) to 95 days**

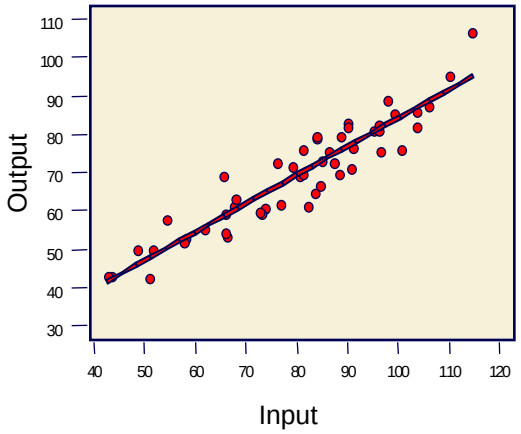
This data includes business working hours, but excludes weekends and holidays; thus customer turnaround time will be longer

Improve Phase - Process Output Categories

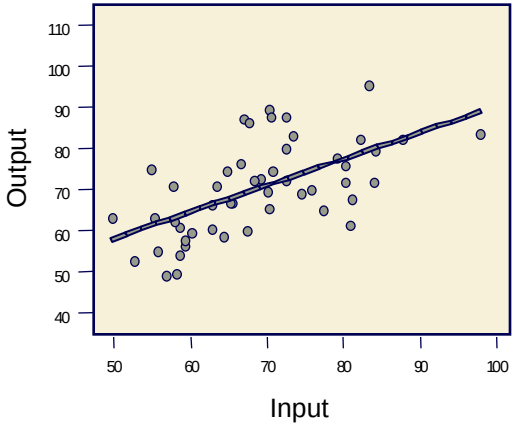


Types and Magnitude of Correlation

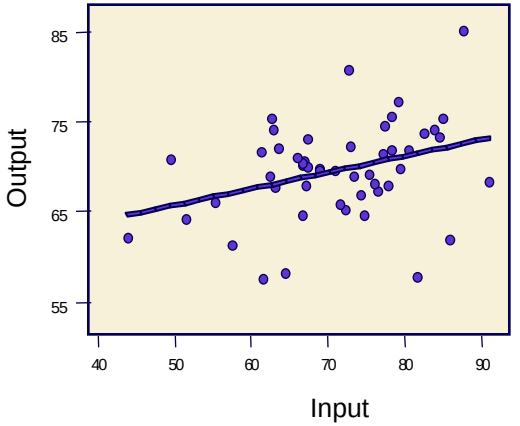
Strong Positive Correlation



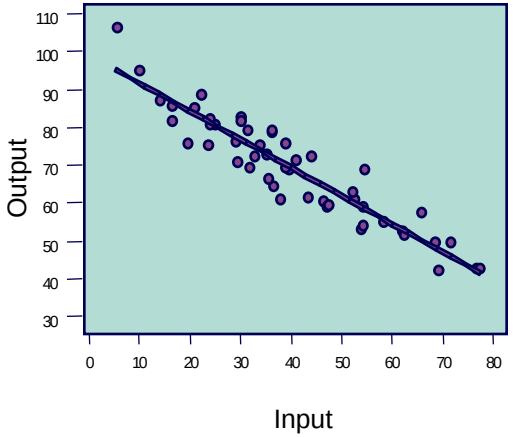
Moderate Positive Correlation



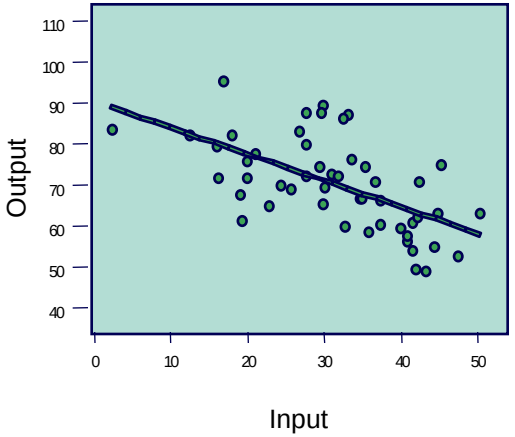
Weak Positive Correlation



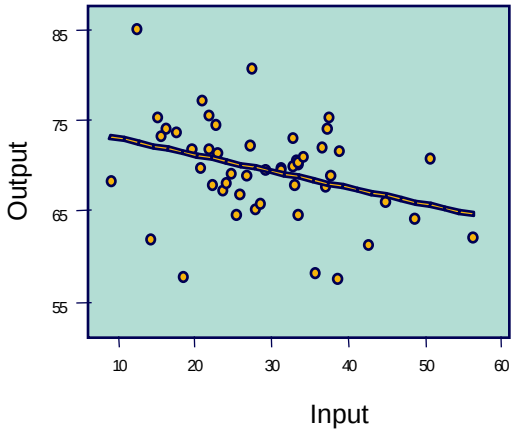
Strong Negative Correlation



Moderate Negative Correlation



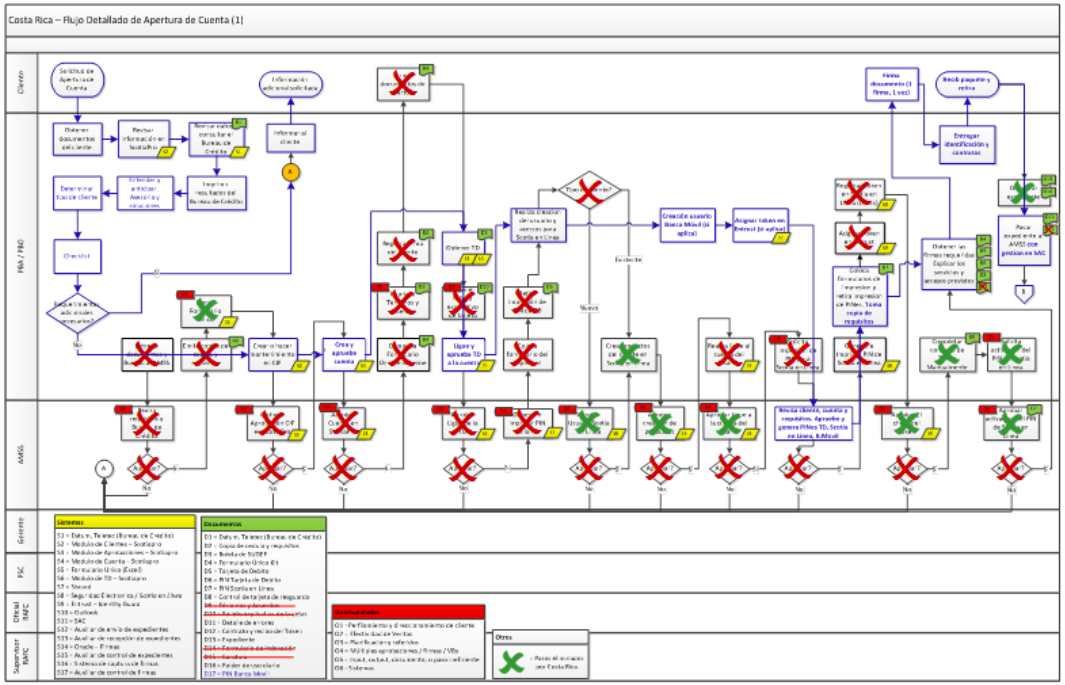
Weak Negative Correlation



Account Opening process

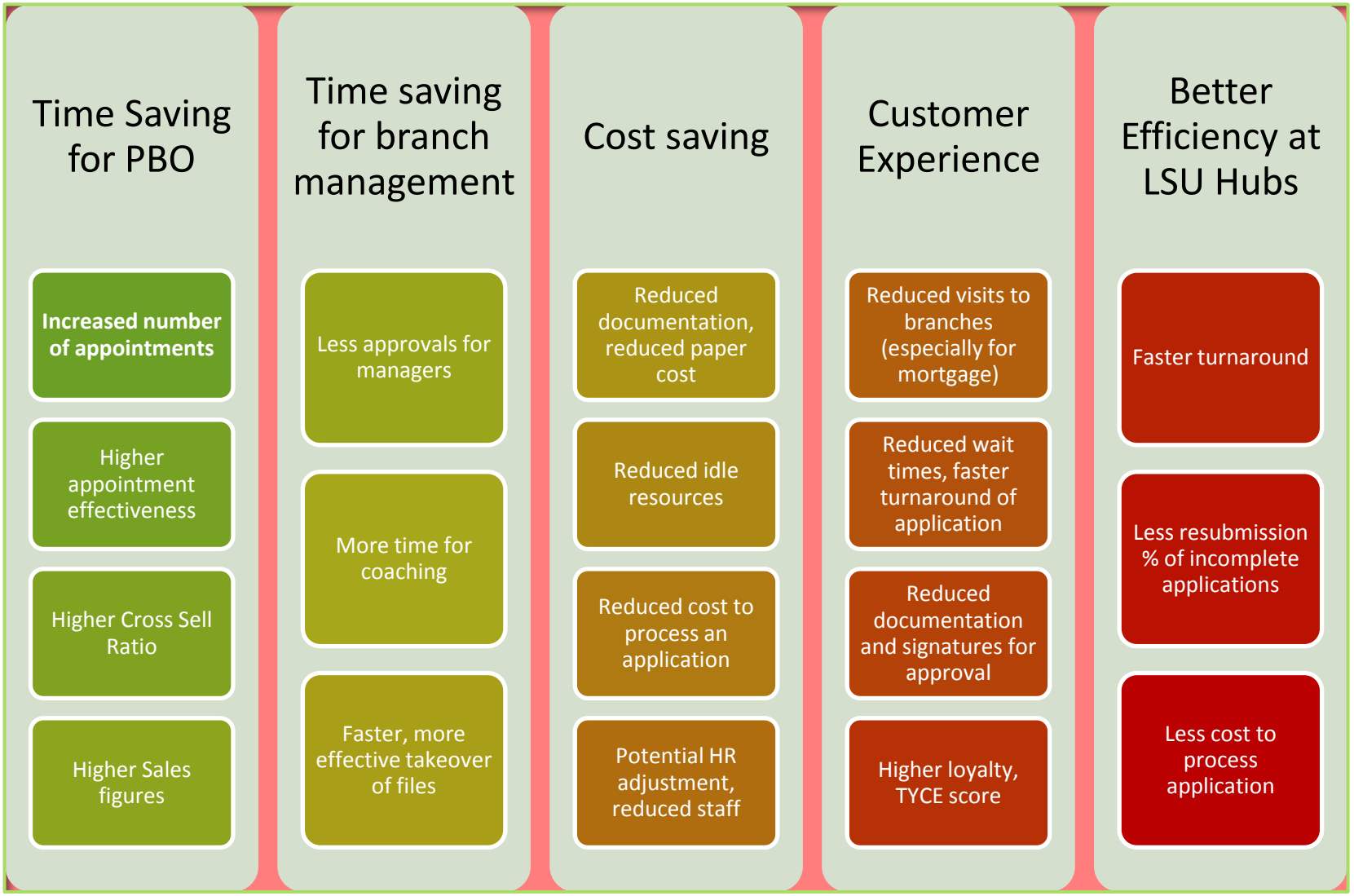
Key Initiatives implemented

- New integrated process flow: Client time has been reduced from 59 min to 42 min however this includes an addition 10 min for a preferred Sales conversation following a standard flow which matches the Sales Conversation Roadmap
- Approval reductions from 11 to 4
- Improved account opening kit: from 11 customer signatures to 2



Actividad	Antes	Después
Tiempo en sucursal con cliente (experiencia del Cliente):	59 min.	42 min. *Incluye 10 minutos + de ventas*
Tiempo en sucursal revisando / aprobando / reprocesando	63 min.	45 min.*
Tiempo total en sucursal para una apertura de cuenta	122 min.	87 min.
AHORRO EN TIEMPO		-35 min.

Potential benefits from Six Sigma E2E projects



Control Phase:

How can we ensure the process does not go back to its original status?

Elements of Control Charts

Developed by Dr Walter A. Shewhart of Bell Laboratories from 1924

Graphical and visual plot of changes in the data over time

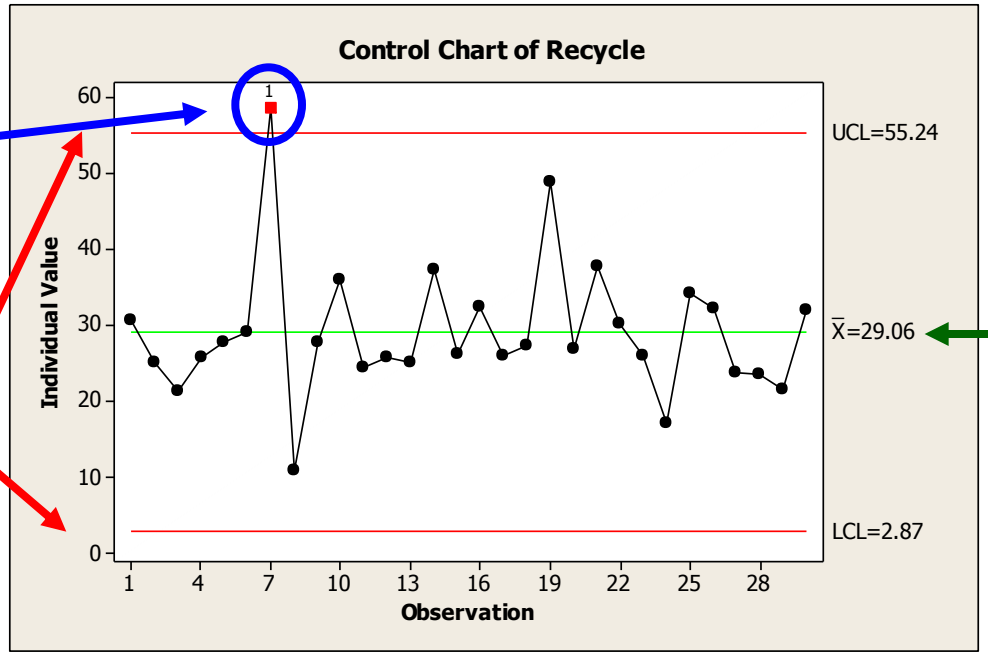
- **This is necessary for visual management of your process.**

Control Charts were designed as a methodology for indicating change in performance, either variation or Mean/Median.

Charts have a Central Line and Control Limits to detect Special Cause variation.

Special Cause Variation Detected

Control Limits



Process Center (usually the Mean)

DMAIC Tools Map

Six Sigma Training
Six Sigma Resources

Define

Project charter
- sponsor
- leader
- facilitator
- team
- stakeholders
- scope
- current state
- future state
- proposal
- costs & resources
- benefits & measures
- project plan
- risk analysis
- related projects

Project selection
- Theory of Constraints
- Decision analysis KT
- Urgent important matrix

SIPOC

Value stream map

DFSS/DFM/DMADV

System thinking / system diagram

PDCA continuous improvement kaizen culture

Knowledge management & information flow

Swim lane deployment chart

Customer pull / just in time

Overall equipment effectiveness OEE

Cost of (poor) quality

General tools
Additional transactional & service tools
More detailed & manufacturing-related tools

Measure

Voice of the customer
- customer survey
- Kano diagram
- CTQ tree
- Quality function deployment / HOQ

Theory of constraints ToC
- Five Focussing Steps

Service demand & capacity analysis

Failure demand analysis

Current state → future state → vision

Flowchart

Time value map

Spaghetti diagram

Time management

Correlation/regression analysis

WIP & inventory control

Analyse

Pareto chart
- power law (long tail)

Activity sampling
- detailed diary
- interruptions log

Root cause analysis
- Five whys
- Why why cause diagram
- Reality tree
- Ishikawa fishbone diagram
- Interrelationship digraph
- Change analysis
- Barrier analysis

Critical chain project management

Overall professional effectiveness

Metrics
- quality
- cost
- delivery
- customer & employee engagement

Probability distributions

Capability analysis Cpk Ppk

SMED rapid changeover

Operational definition

Measurement systems (gage) analysis

Hypothesis testing

Lean cell

Design of experiments

Sampling calculations

Yamazumi balancing chart

Heijunka load levelling

Jidoka autonomation

Andon

ANOVA

Cycle time analysis. Takt time

Kanban systems

Total productive maintenance

Improve

Risk analysis
- impact-probability matrix
- FMEA
- PDPC

Control

Innovation
- brainstorming
- affinity diagram
- Six Thinking Hats
- Mindmapping
- paradigms
- TRIZ; Pugh matrix
- morphological box
- creativity tools

5S organisation

After action review

Standard work

Poka yoke mistake proofing

Visual workplace

Control charts

Change management
- kaizen blitz
- hoshin kanri
- leadership
- mentors/champions
- culture
- communications plan
- RACI chart
- incremental / strategic
- Forcefield analysis

Pilot testing

Total productive maintenance

Information about Six Sigma Certification

Six Sigma Hierarchy of Belts

- Coaches and trains Black belts
- Has over 5 years experience

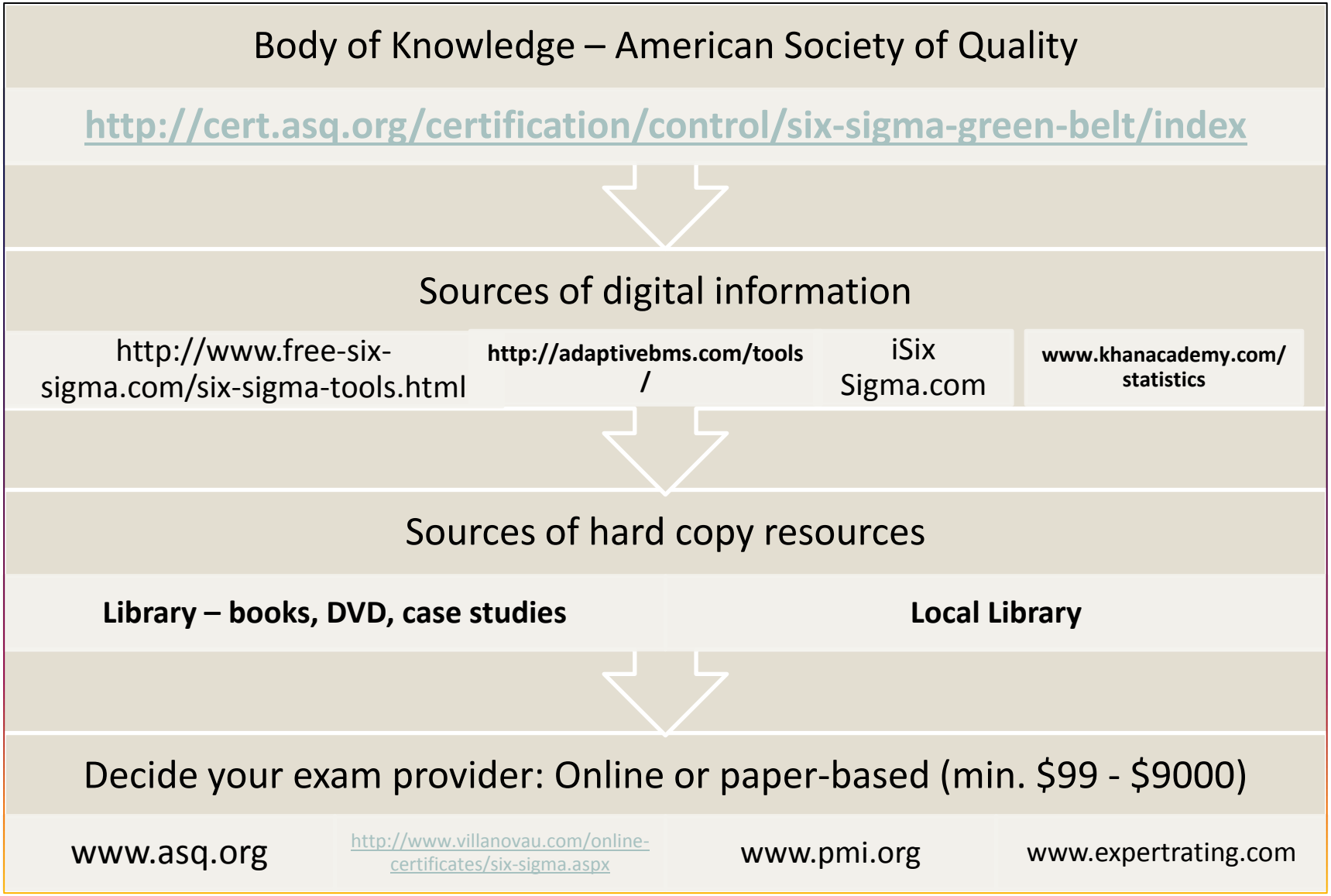
- Certified to lead a Six Sigma project
- Has high level of statistical analysis and determines project scope & flow

- Certified to work on Six Sigma Projects
- Works on data analysis and provides support to determine outcome of the project

- Is Aware of Six Sigma concepts
- Plays a key role as a six sigma project team member

- Elimination of waste and non-value added activities

How to Get Certified



Thank you for your attention

- *QUESTIONS?*
- *FEEDBACK?*

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