Using Six Sigma for Process Improvement

Office of Continuous Improvement, Information Technology

Office of Continuous Improvement

Our primary goal is to improve process efficiency and effectiveness at Valparaiso University in order to improve constituent satisfaction and resource utilization

OCI Staff

valpo.edu/it/oci

Services Provided by the OCI

- Needs assessment and recommendations for improvement
- Measurement and data analysis
- Process review and recommendations for improvement
- Documentation training and review

- Project scoping
- Project management
- Centralized Continuous Improvement project management reporting
- Continuous Improvement Coaching
- Training of improvement methods and tools

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Six Sigma (6σ) vs. DPMO

Sigma	DPMO
1	690,000
2	308,000
3	66,800
4	6,210
5	320
6	3.4

How do we achieve Six Sigma?

<u>DMAIC</u>

The universal problem-solving methodology for Process Improvement

(Diagram: circular DMAIC cycle with segments labeled Define, Measure, Analyze, Improve, Control)
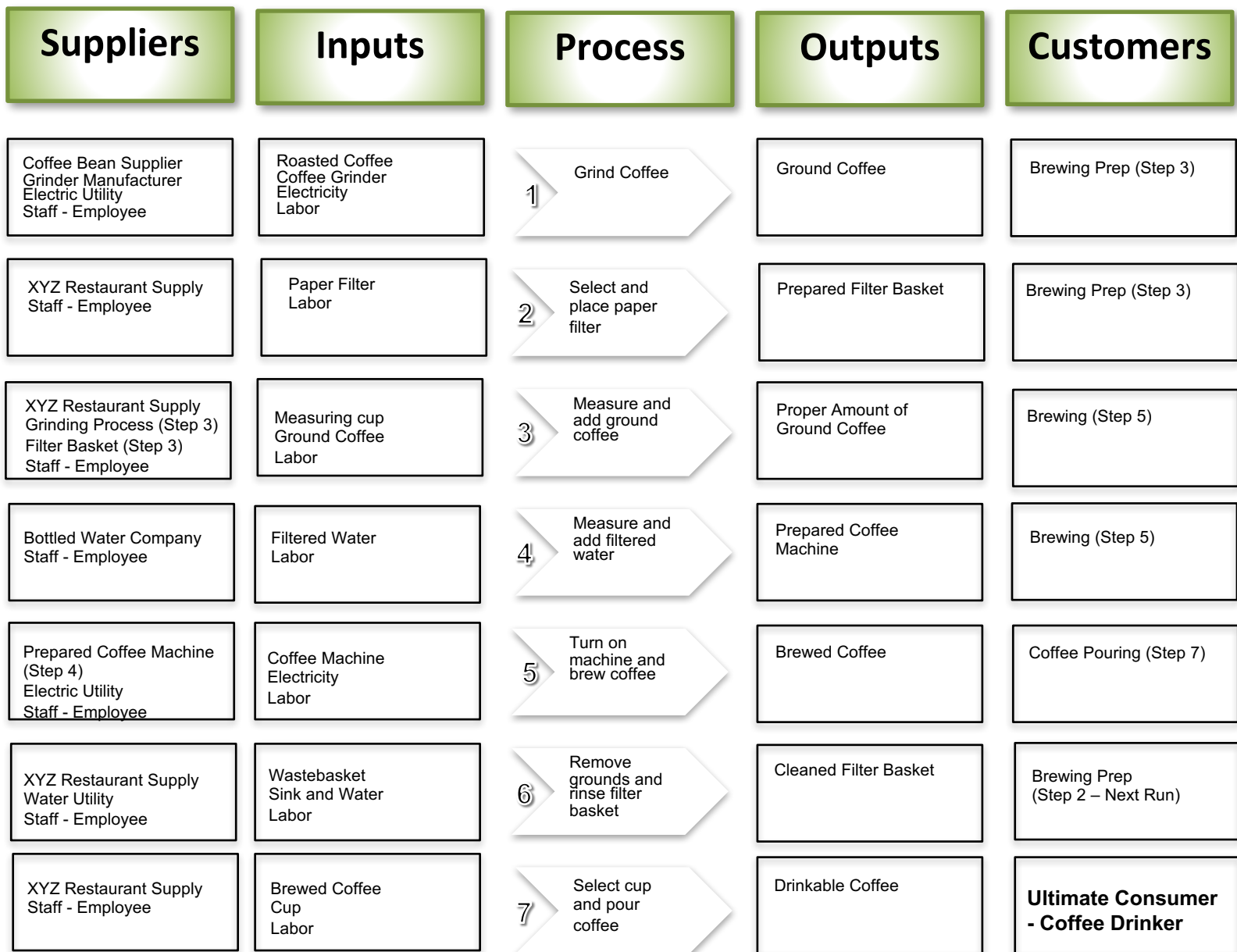
DEFINE – Project Charter

- **Problem Statement**: What problem is the team improving?
- **Business Case**: Why is it important for the institution to complete this project?
- **Measurable (SMART) Goals/Objectives**: How will you measure improvement?
- **Project Scope**: What's in? What's out?
- **Team Members**: Who is leading the project? Who is on the core project team?
- **Resources**: What resources (people, time, financial, etc.) will be needed?
- **Milestones**: What are the important dates for the project?

SIPOC

| Suppliers | Inputs | Process | Outputs | Customers |

Step 1 → Step 2 → Step 3 → Step 4 → Step 5
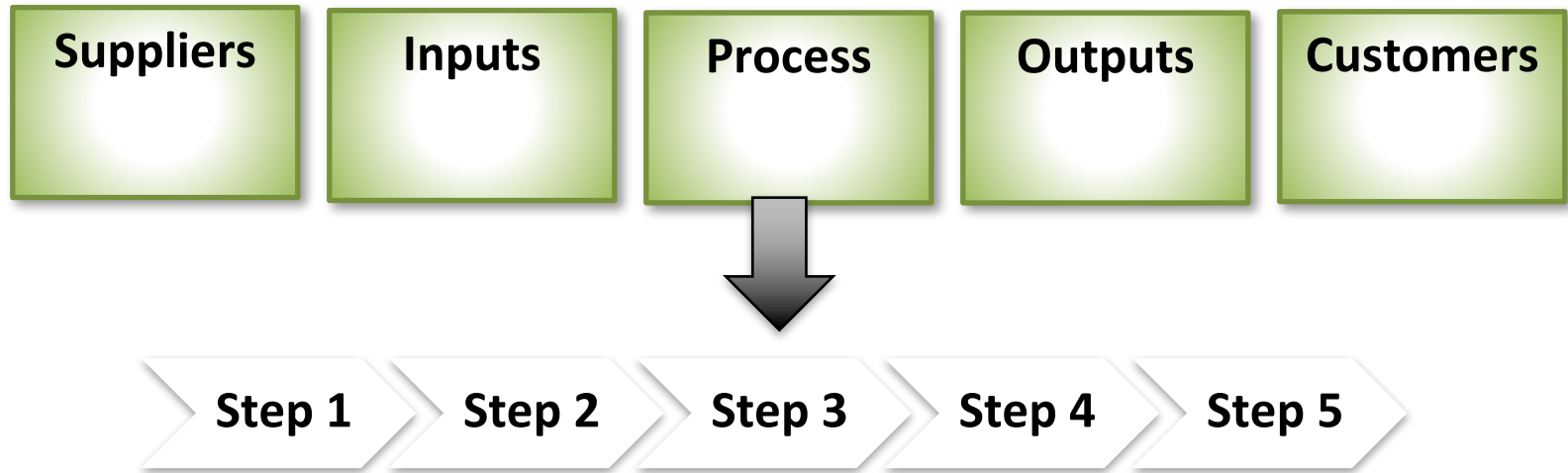
- A high-level view of the process, which helps to:
  - Define project scope
  - Identify where to collect data
  - Maintain focus on the customer

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Suppliers	Inputs	Process	Outputs	Customers
Coffee Bean Supplier Grinder Manufacturer Electric Utility Staff - Employee	Roasted Coffee Coffee Grinder Electricity Labor	1 Grind Coffee	Ground Coffee	Brewing Prep (Step 3)
XYZ Restaurant Supply Staff - Employee	Paper Filter Labor	2 Select and place paper filter	Prepared Filter Basket	Brewing Prep (Step 3)
XYZ Restaurant Supply Grinding Process (Step 3) Filter Basket (Step 3) Staff - Employee	Measuring cup Ground Coffee Labor	3 Measure and add ground coffee	Proper Amount of Ground Coffee	Brewing (Step 5)
Bottled Water Company Staff - Employee	Filtered Water Labor	4 Measure and add filtered water	Prepared Coffee Machine	Brewing (Step 5)
Prepared Coffee Machine (Step 4) Electric Utility Staff - Employee	Coffee Machine Electricity Labor	5 Turn on machine and brew coffee	Brewed Coffee	Coffee Pouring (Step 7)
XYZ Restaurant Supply Water Utility Staff - Employee	Wastebasket Sink and Water Labor	6 Remove grounds and rinse filter basket	Cleaned Filter Basket	Brewing Prep (Step 2 – Next Run)
XYZ Restaurant Supply Staff - Employee	Brewed Coffee Cup Labor	7 Select cup and pour coffee	Drinkable Coffee	**Ultimate Consumer - Coffee Drinker**

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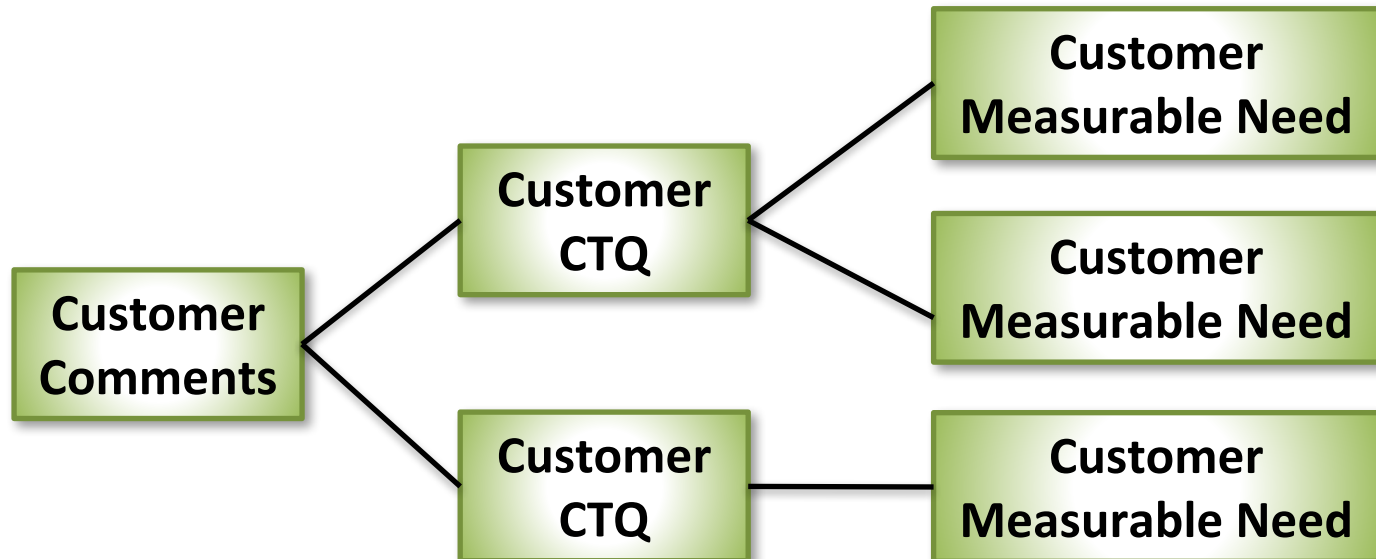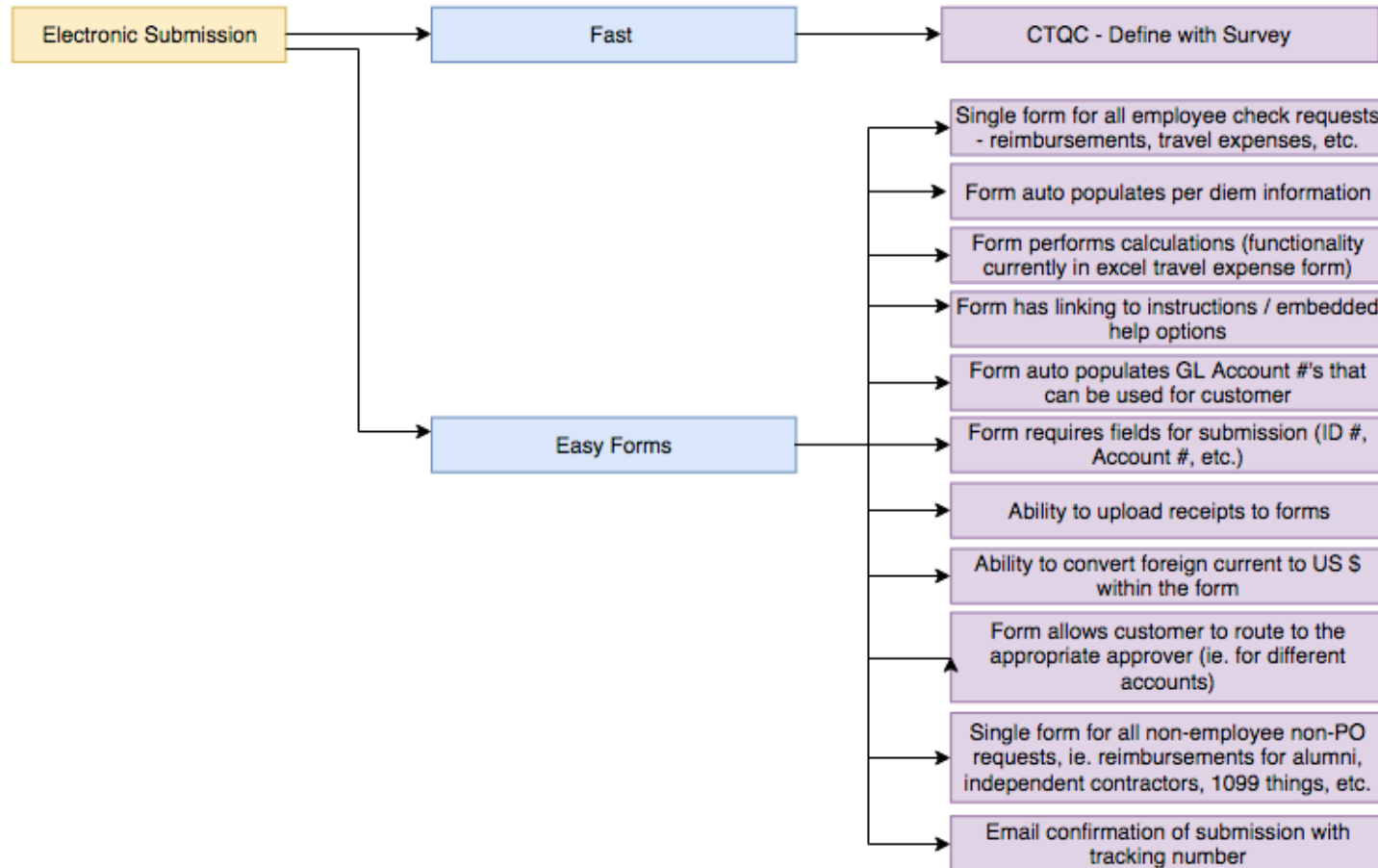
5 Why Analysis

- Define the Problem
    1. Why is that happening?
    2. Why is that happening?
    3. Why is that happening?
    4. Why is that happening?
    5. Why is that happening?

- Can be 4, 5, 6, etc. depending on problem. Don't go into obscurity.
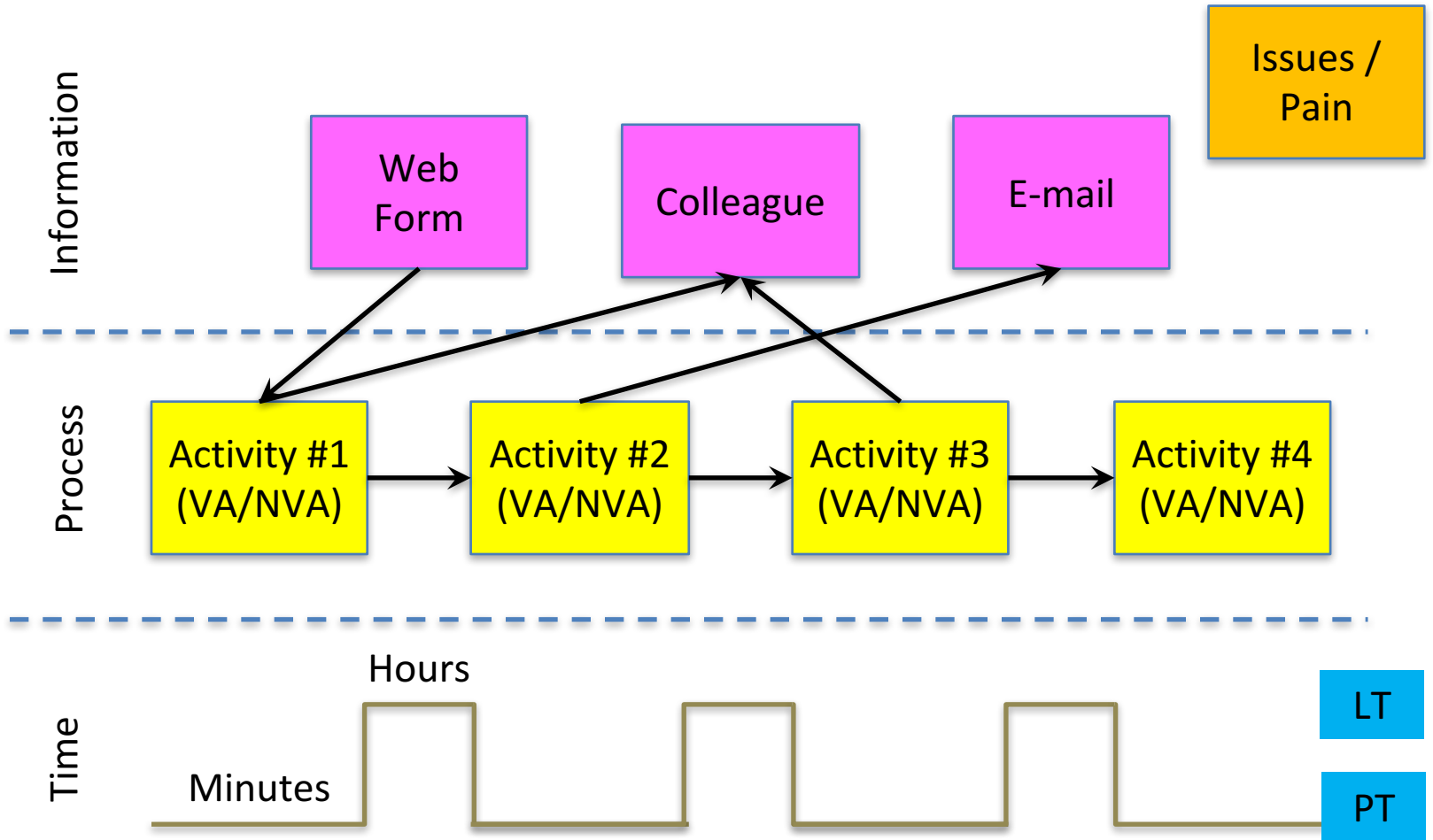
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Voice of the Customer (VOC)

VOC translates what customers say they want into measurable customer requirements based on what customers find critical to quality (CTQ).
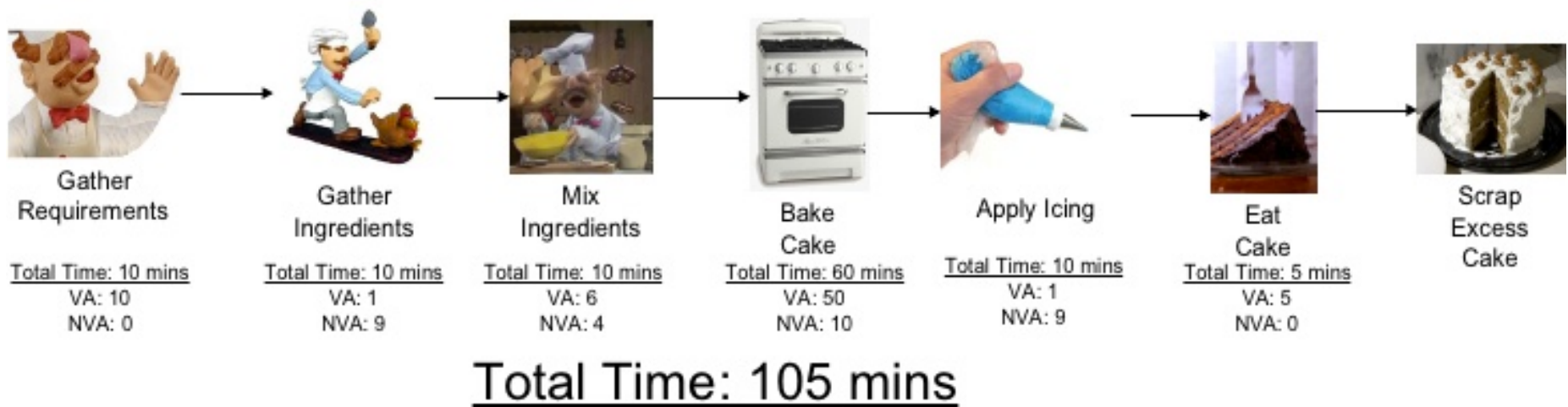

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Example from Check Request Project

Electronic Submission → Fast → CTQC - Define with Survey

Easy Forms:
- Single form for all employee check requests - reimbursements, travel expenses, etc.
- Form auto populates per diem information
- Form performs calculations (functionality currently in excel travel expense form)
- Form has linking to instructions / embedded help options
- Form auto populates GL Account #'s that can be used for customer
- Form requires fields for submission (ID #, Account #, etc.)
- Ability to upload receipts to forms
- Ability to convert foreign current to US $ within the form
- Form allows customer to route to the appropriate approver (ie. for different accounts)
- Single form for all non-employee non-PO requests, ie. reimbursements for alumni, independent contractors, 1099 things, etc.
- Email confirmation of submission with tracking number

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Value Stream Map

Value Stream Map Example

	Gather Requirements	Gather Ingredients	Mix Ingredients	Bake Cake	Apply Icing	Eat Cake	Scrap Excess Cake
Total Time	10 mins	10 mins	10 mins	60 mins	10 mins	5 mins	
VA	10	1	6	50	1	5	
NVA	0	9	4	10	9	0	

Total Time: 105 mins

Value Added

The activity physically changes the product or adds important information <u>required by the customer</u>

Value-Added Time Breakdown for Making Coffee
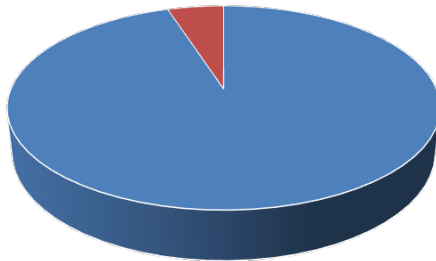
- Value-Added
- Non-Value-Added
- Non-Value-Added; but necessary

Step	Time
Walk to Freezer	3 Sec.
Retrieve Coffee	3 Sec.
Walk to Grinder	2 Sec.
Grind Coffee	30 Sec.
Walk to Storage	2 Sec.
Select Filter	3 Sec.
Walk to Coffee Maker	3 Sec.
Install Filter	4 Sec.
Walk to Grinder	3 Sec.
Collect Ground Coffee	3 Sec.
Walk to Coffee Maker	2 Sec.
Measure & Load Ground Coffeee	3 Sec.
Pick up Coffee Pot	3 Sec.
Walk to Water Source	3 Sec.
Fill Pot with Water	5 Sec.
Walk to Coffee Maker	3 Sec.
Fill Coffee Pot	3 Sec.
Turn on Coffee Pot	3 Sec.
Brew Coffee	295 Sec.
Remove Filter Basket	4 Sec.

Value-Added Steps	Non-Value-Added Steps
	Walk to Freezer 3 Sec.
Retrieve Coffee 3 Sec.	
	Walk to Grinder 2 Sec.
Grind Coffee 30 Sec.	
	Walk to Storage 2 Sec.
Select Filter 3 Sec.	
	Walk to Coffee Maker 3 Sec.
Install Filter 4 Sec.	
	Walk to Grinder 3 Sec.
Collect Ground Coffee 3 Sec.	
	Walk to Coffee Maker 2 Sec.
Measure & Load Ground Coffeee 3 Sec.	
Pick up Coffee Pot 3 Sec.	
	Walk to Water Source 3 Sec.
Fill Pot with Water 5 Sec.	
	Walk to Coffee Maker 3 Sec.
Fill Coffee Pot 3 Sec.	
Turn on Coffee Pot 3 Sec.	
Brew Coffee 295 Sec.	
Remove Filter Basket 4 Sec.	

Eliminate Waste (TIMWOODS)

WASTE

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People

Computer not updated

Wrong fee

Too much coffee

rude

No training

Procedures

No training

Too much water

Too many grounds

Wrong size filter

Bad cream

Brew time too long

Outdated

Bad sugar

Lids don't fit cup

Packets wet

Dirty basket

Material

Dirty cups

Coffee not hot enough

Warmer not working

Equipment

Bad coffee

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Cause & Effect Diagram
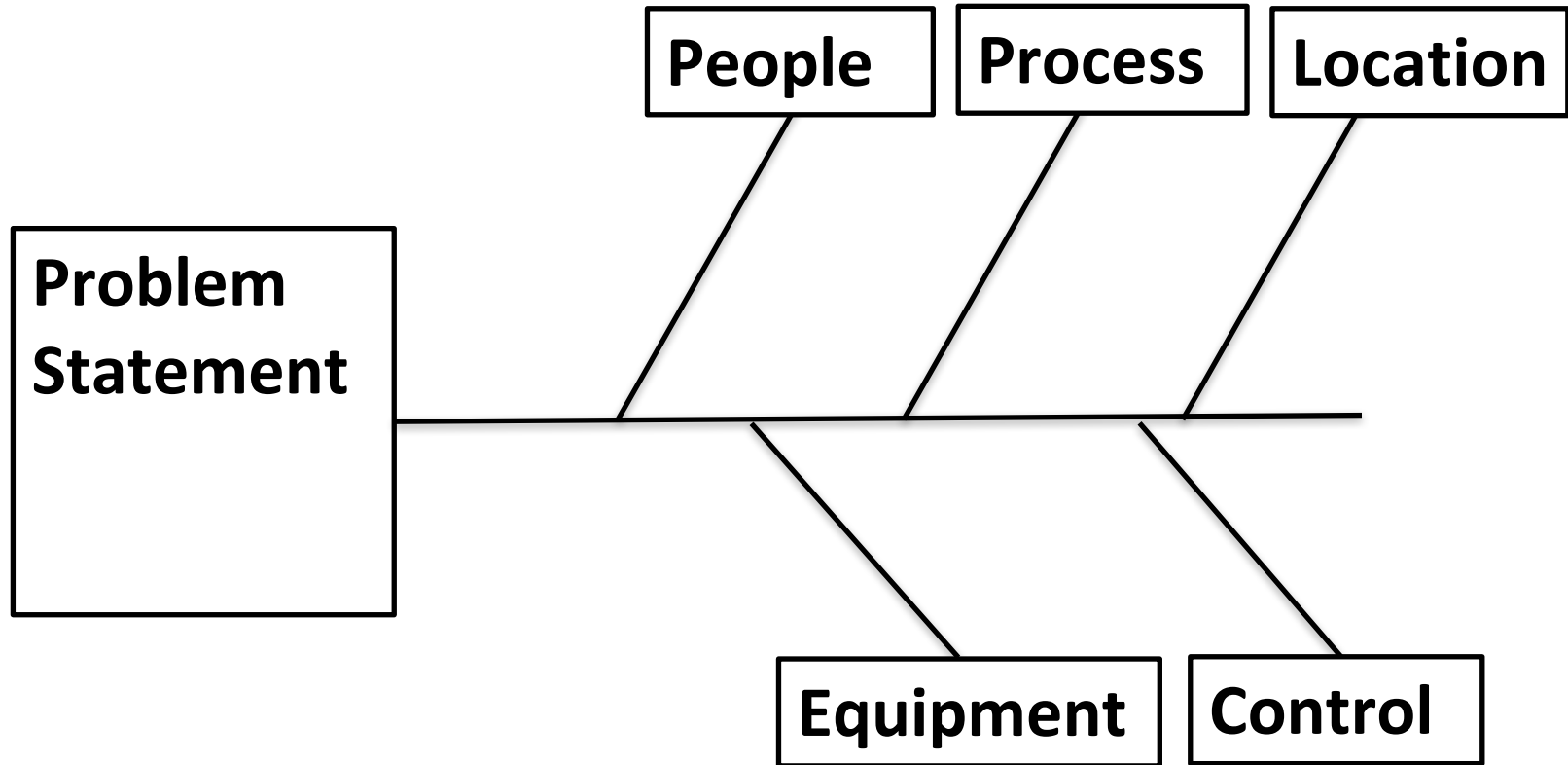
Improve

- Identify problems and solutions to improve the process (Plan), Implement (Do), test (Check), and modify solutions (Act) until the desired objectives have been achieved.
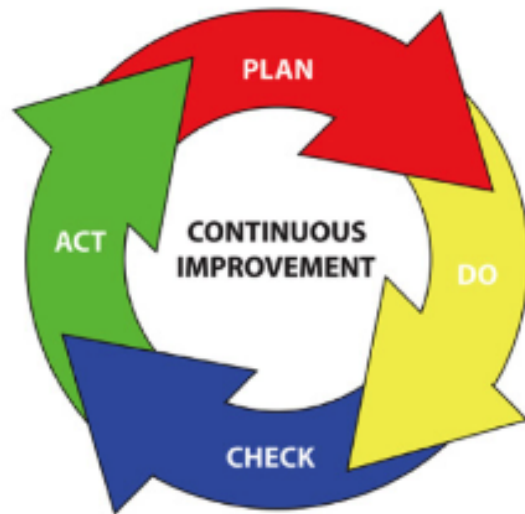
Brainstorming

- The problem to be solved is stated and written down for everyone to see
- Establish ground rules
  - No judgement
  - Everyone contributes
- Record ideas on a flipchart or whiteboard exactly as given – no paraphrasing
- Group ideas into categories – eliminate duplicates

Check Request / Travel Expense Process Focus Group #1

Grant Process (is unique in many ways)

Payments / Checks
14 Votes

- Direct Deposit Refunds
- Direct Deposits
- Appreciate the partnership with Finance to get the check to the vendor in the appropriate way
- Should be able to receive payment electronically

Online
11 Votes

- Online Submission
- Need to have an electronic form
- Put forms to online process
- How can it all be electronic? Saves Paper.
- Don't like: Paper based form. It is outdated. Need more space to store...
- Online Submission & Approval 3 Votes
- Is online form - process a better idea / option?
- Couldn't more be done electronically?
- Electronic submission desirable (online system) 1 Vote
- Not able to submit online = bad
- Move all forms online

Routing
1 Vote

- Need to have a routing indication section 1 Vote
- Depending on signatures it may take more time 1 Vote
- If someone who needs to sign is out - vacation or sick - it may take more time
- Depending on the account #, it may need more than one signature

Tracking
2 Votes

- Tracking system could be streamlinesd
- VENI Acces (see if the check has been cut) is not available to all people
- Need better electronic monitoring of the process - online submission
- Admins can check on checks
- The person can check on checks

Process Time / Info
3 Votes

- Travel Expense is inconsistent turn around time for checks to employees
- Notifications of checks issued and mailed would be helpful 3 Votes
- Some departments select their own per diem rate
- Travel expense - employee should not be held accountable / have checks withheld because an account is in the negative. It is not w/in their responsibilities to manage accounts
- Turn around time varies
- Don't like that it takes longer to process (due to paper based format) and we don't necessarily know when the check is cut or mailed. 1 Vote
- Usually an efficient process. Certain accounts it seems to take longer.
- Communication and process
- Inconsistent bounce back from Finance
- Travel Expense - We need to expedite processing of checks. It should not take longer than 3 weeks.
- Dislike how fast it is processed
- Call it by what it is, not the color of the sheet
- Dislike - Never know what timeline is despite putting "when needed" date. No guarantee.
- Notification to department that check was processed and when it is mailed out.
- Entire process is too time intensive

(Travel Expense column)

- Travel Expense - Not having to submit receipts is very nice for efficiency
- Have two lines for two different signatures to approve the reimbursement
- Travel expense per diem costs departments money even when trying to be honest. If only wanting to claim "breakfast" but only allowed to claim "dinner" the traveler profits
- Provide 2 lines for budget #s when needing to use two different budget #s for covering funds for the expenses
- Online form attachment 2 Votes
- How can receipts be done electronically?
- Need original receipts - how can it be done electronically?
- Should be able to scan and submit receipts electronically 1 Vote

Software approval / online
11 Votes

- Include per diem rates on website somewhere so it's easier for us to check if it qualifies as a high rate or a low rate 2 Votes
- Move them to electronic approval
- It's good to calculate the travel on the excel expense sheet
- Online process so requester --> to supervisor / advisor can fill out & approve more efficiently
- Automation / real time updates of things like mileage, per diem, etc. 1 Vote
- Non-Employee Reimbursement
- Submit online form for supervisor approval
- Online submission & approval - similar to vacation approval would expedite for those w/ supervisors who are trained
- Remote Access for approval 3 Votes

Information Needed for Process
14 Votes

- Rates by city - information needed
- Admissions - when are per diems updated?
- Annual Reminder of the process
- People use the old form
- What information is needed? Multiple times out of office. Departmental / return time. Description of the trip
- Dislike when folks get confused whether admin only can fill in "person requisitioning"
- Where is request for check form?
- People use saved copy instead of updated (current) form
- Better linking to form [from other websites]
- High cost / low cost areas need to be more readily available
- Way to make sure money is in the account and approval
- Per diem / mileage [needs] automatic update
- Dislike that folks never know whether to use ID# or SSN
- Budget # made mandatory some how
- Dislike mail to: or return to: - gets confusing
- Should not be sending SSNs through the mail
- Need uniform process and communication
- Unclear who to send forms to. it has changed often in the last few years.
- Process [needs] clear direction on when to do a check request and when to do a P.O.
- [Need] clarification on when check request versus purchase order. Feels like the answer is always "well, it depends"
- Need simplicity 2 Votes

Check Request / Travel Expense Process Focus Group 2

It is always a fun surprise when I get reimbursements, I don't know when they are coming

Receipts
3 Votes

- Need to have an easier way to submit receipts
- Do receipts have to be real / actual versus scanned & emailed to us? 2 Votes
- Need way to submit for non employees / off campus reiumbursements
- Have to remember and track all of the forms I submit. Sometimes I forget what was sent in.

Reimbursement Process

- Dislike tracking mileage on monthly reimbursement
- [Dislike being forced to use] per diem on form versus credit card if available 1 Vote
- Use of IRS per diem for meals and incidental expenses makes life a lot easier 1 Vote

(Right column - cut off)

- I've always submitted both W9 and independent contractor forms together to Melissa Schenck versus sending W9s procurement
- New Independent contractor form
- W9 to procurement
- Cont...

Tracking / Approv (cut off)
10 votes

- Would like an electronic form with approvals to track
- Hard to track where it is in the process
- Need tracking through process
- Need online SW proc like vacation

Submission Process
11 Votes

- Recommend online submission form 1 Vote
- Recommend online form
- [Dislike that] each form must be hand delivered or mailed to finance 1 Vote
- Like the formulas in the worksheet
- Process is straight forward for travel expense form
- Paper vs electronic
- Don't like manual process
- I would love to see this process be more automated (online)
- Use the existing systems 2 Votes
- Check request form is fairly simple
- Like the pre-built excel form for travel

(Bottom right column - cut off)

- Time consuming
- [Dislike] that it is returned via campus mail when error or missing info 1 Vote
- Pros - turn around time
- Too long of a turn around time
- Turn around time is usually good
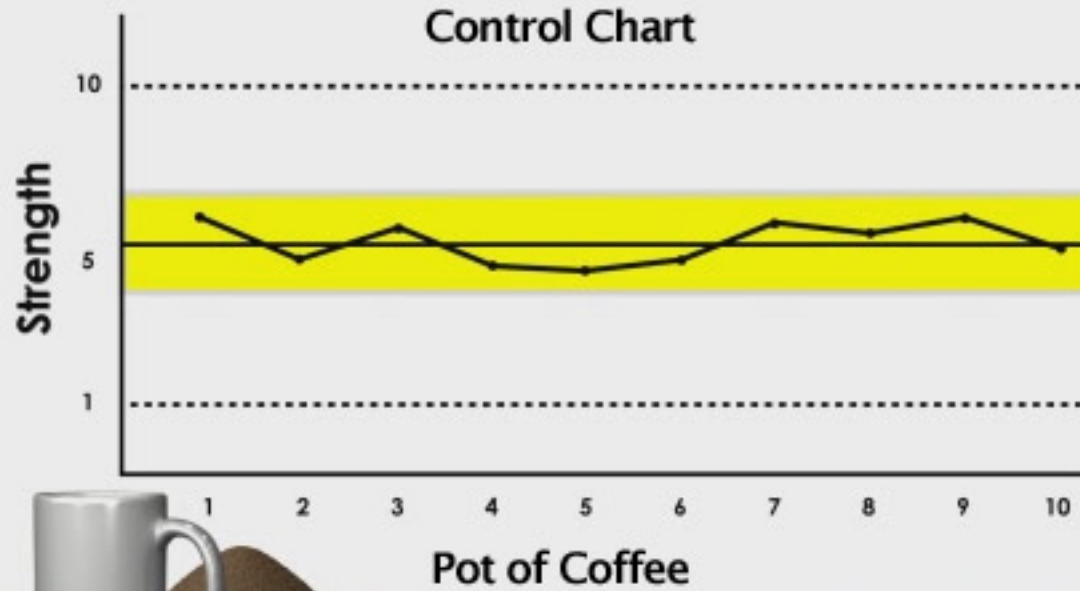- If revisions need to be made, the employee should be notified via e-mail

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Control

Make sure that the process improvements stick through documentation, training and auditing.

Coffee Strength

Control Chart

Strength

Pot of Coffee

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Process Documentation

- Defines the process owner and provides a fundamental understanding of the process

- Allows any other team member the ability to recreate results (which reduces variability!)
  - Documentation needs to be accessible
  - Documentation needs to be reviewed regularly

1. Draw a pig

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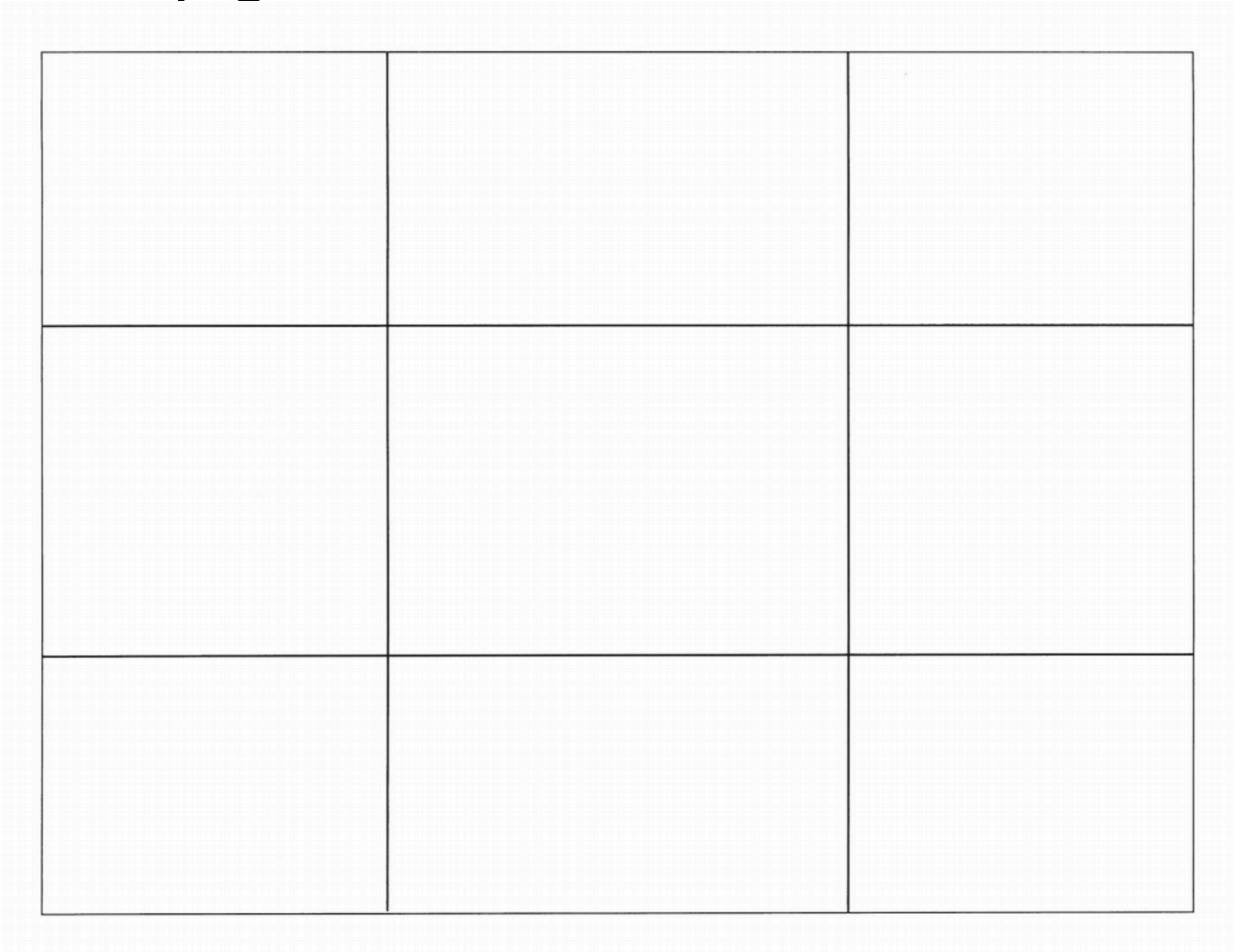
1. Draw the side profile of a pig, centered on the page.

2. Make sure the pig's head is facing left.

3. The pig should be drawn large enough so that a piece of it is in every box EXCEPT the top right.

1. Draw a capital M, so the tip of the middle V of the M touches the intersection of the grid lines in the NW quadrant
2. Draw a capital W, so the tip of the middle V of the W touches the intersection of the grid lines in the SW quadrant
3. Draw a capital W, so the tip of the middle V of the W touches the intersection of the grid lines in the SE quadrant
4. Go back to the M you drew in Step 1, and draw a slightly upwardly bowed line that runs from the most eastern point of the M, to the intersection of the grid lines in the NE quadrant.
5. Continue that line from the intersection of the grid lines in the NE quadrant to the most easterly point of the W that you constructed in the 3rd step.
6. Draw a downwardly bowed line from the most western point of the W in the SE quadrant, to the most easterly point of the W in the SW quadrant.
7. In the exact middle of the box between the NW quadrant and the SW quadrant, draw a circle the size of a dime.
8. Draw an inwardly bowed line from the most westerly point of the M created in Step 1, to the top of the circle you just drew in Step 7
9. Draw an inwardly bowed line from the most westerly point of the W created in Step 2, to the bottom of the circle you drew in Step 7.
10. Draw a horizontal straight line about ½ inch in length starting from the middle of the line you created in Step 8.
11. Draw a horizontal straight line about 1/3 inch in length starting from the middle of the line you drew in step 9.
12. Draw a curly-cue about 1 inch in length starting at the upper third of the line you created in Step 5, extending in an easterly direction.
13. Put two dots in middle of the circle you drew in Step 7, arranged horizontally, and about ¼ of an inch apart.

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Standard Operating Procedure
Standardize Work Instruction

Status   Final
Revision   1
Rev. Date 8/29/2005

Procedure Number PIG0001-A   Page 1 of 1

Task	Description	Sub-Task	Instructions
1	Draw a letter M at the top left intersection.	1.1	Bottom center of M touches intersection
2	Draw letter W at bottom left intersection	2.1	Top center of W touches intersection
3	Draw letter W at bottom right intersection	3.1	Top center of W touches intersection
4	Draw arc from letter M to top right intersection		
5	Draw another arc from top right intersection to bottom right W		
6	Draw an arc between the two bottom Ws		
7	Draw the letter O in center left box		
8	Draw arc from letter M to tangent of the circle		
9	Draw arc from left W to tangent of the circle		
10	Draw an arc for the mouth	10.1	Half way between the W and circle
		10.2	Must be a happy pig
11	Draw an arc for the eyes	11.1	Half way between the M and circle
12	Draw cursive letter e near top of arc on right		
13	Draw two dots in middle of circle for pigs' nose.		

Standard Pig Round 3

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1. Draw a capital M, so the tip of the middle V of the M touches the intersection of the grid lines in the NW quadrant

2. Draw a capital W, so the tip of the middle V of the W touches the intersection of the grid lines in the SW quadrant

3. Draw a capital W, so the tip of the middle V of the W touches the intersection of the grid lines in the SE quadrant

4. Go back to the M you drew in Step 1, and draw a slightly upwardly bowed line that runs from the most eastern point of the M, to the intersection of the grid lines in the NE quadrant.

5. Continue that line from the intersection of the grid lines in the NE quadrant to the most easterly point of the W that you constructed in the 3rd step.

6. Draw a downwardly bowed line from the most western point of the W in the SE quadrant, to the most easterly point of the W in the SW quadrant.

7. In the exact middle of the box between the NW quadrant and the SW quadrant, draw a circle the size of a dime.

8. Draw an inwardly bowed line from the most westerly point of the M created in Step 1, to the top of the circle you just drew in Step 7

9. Draw an inwardly bowed line from the most westerly point of the W created in Step 2, to the bottom of the circle you drew in Step 7.

10. Draw a horizontal straight line about ½ inch in length starting from the middle of the line you created in Step 8.

11. Draw a horizontal straight line about 1/3 inch in length starting from the middle of the line you drew in step 9.

12. Draw a curly-cue about 1 inch in length starting at the upper third of the line you created in Step 5, extending in an easterly direction.

13. Put two dots in middle of the circle you drew in Step 7, arranged horizontally, and about ¼ of an inch apart.

Additional Resources

- Six Sigma Toolbox from Moresteam.com
    - https://www.moresteam.com/toolbox/index.cfm
- ASQ-American Society for Quality:
    - http://asq.org/index.aspx
- Moresteam:
    - https://www.moresteam.com/
- iSixSigma:
    - https://www.isixsigma.com/
- Six Sigma Daily (Villanova):
    - http://www.sixsigmadaily.com/
- LeanOhio:
    - http://lean.ohio.gov/

Recap

- Go to where the work is done to really understand the process

- If it's important enough to do, it's important enough to document

- Don't let perfect get in the way of better – the best method is the one you actually use.

- Success is about mindset - *"The pessimist sees difficulty in every opportunity. The optimist sees the opportunity in every difficulty." - Winston Churchill*

Q&A