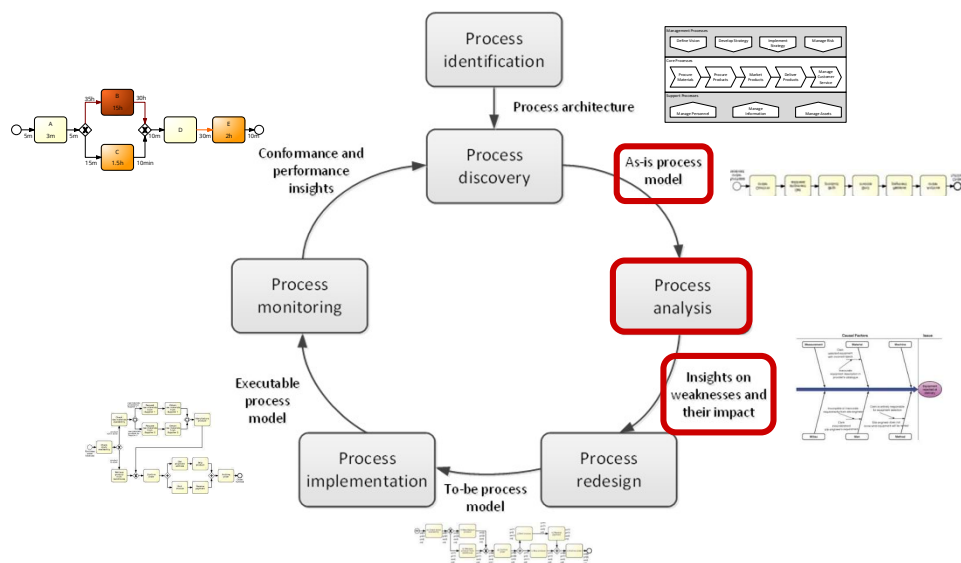# Qualitative Process Analysis

Spring 2021 - MAJU

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Process Analysis in the BPM Lifecycle

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Process Analysis Techniques
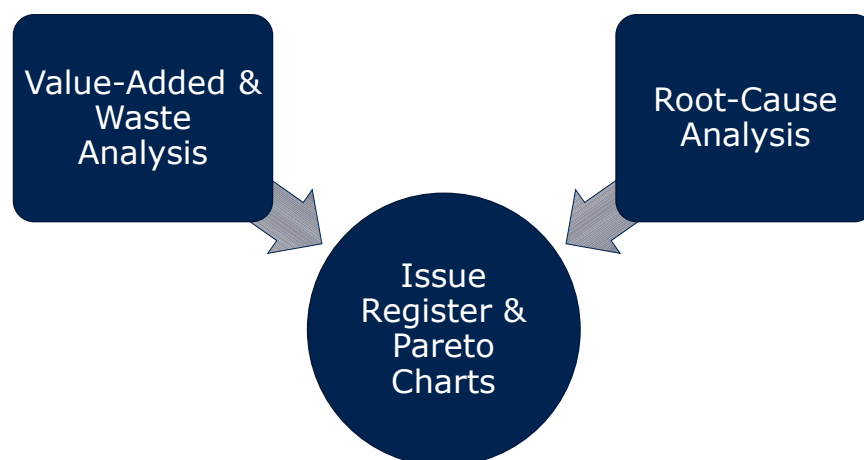
Qualitative analysis

- Value-Added & Waste Analysis
- Root-Cause Analysis
- Pareto Analysis
- Issue Register

Quantitative Analysis

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Qualitative Analysis

Value-Added & Waste Analysis

Root-Cause Analysis

Issue Register & Pareto Charts

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Value-added Analysis

1. Decorticate the process into steps
   - Steps performed before a task
   - The task itself, possibly decomposed into smaller steps
   - Steps performed after a task, in preparation for the next task
2. Classify each step
   - Value-adding (VA)
   - Business value-adding (BVA)
   - Non-value-adding (NVA)

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Value-adding Activities

Maximize

- Produces value or satisfaction to the customer.
- Criteria:
  - Is the customer willing to pay for this step?
  - Would the customer agree that this step is necessary to achieve their goals?
  - If the step is removed, would the customer perceive that the end product or service is less valuable?
- Examples:
  - Order-to-cash process: Confirm delivery date, Deliver products
  - University admission process: Assess application, Notify admission outcome

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Business Value-adding Activities

Minimize

- Necessary or useful for the business to operate.
- Criteria
  - Is this step required in order to collect revenue, to improve or grow the business?
  - Would the business (potentially) suffer in the long-term if this step was removed? Does it reduce risk of business losses?
  - Is this step required in order to comply with regulatory requirements?
- Example
  - Order-to-cash process: <u>Check</u> purchase order, <u>Check</u> customer's credit worthiness, Issue invoice, Collect payment, Collect customer feedback
  - University admission process: <u>Verify</u> completeness of application, <u>Check</u> validity of degrees, <u>Check</u> validity of language test results

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Non-value-adding Activities

Remove

- Everything else besides VA and BVA
- Incudes:
  - Handovers, context switches
  - Waiting times, delays
  - Rework or defect correction
- Examples
  - Order-to-cash: <u>Forward</u> PO to warehouse, <u>Re-send</u> confirmation, <u>Receive</u> rejected products
  - University admission: <u>Forward</u> applications to committee, <u>Receive</u> admission results from committee

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Extract of Equipment Rental Process
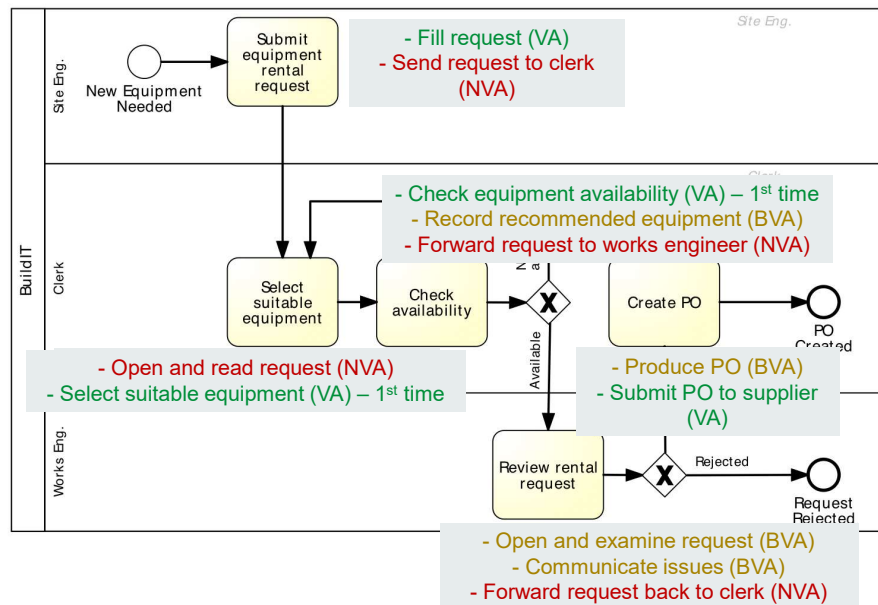
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Equipment Rental Process – VA Analysis

Step	Performer	Classification
Fill request	Site engineer	VA
Send request to clerk	Site engineer	NVA
Open and read request	Clerk	NVA
Select suitable equipment	Clerk	VA
Check equipment availability	Clerk	VA
Record recommended equipment & supplier	Clerk	BVA
Forward request to works engineer	Clerk	NVA
Open and examine request	Works engineer	BVA
Communicate issues	Works engineer	BVA
Forward request back to clerk	Works engineer	NVA
Produce PO	Clerk	BVA
Send PO to supplier	Clerk	VA

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Exercise

- Pharmacy prescription process (Exercise 1.6)
  - Identify at least three VA steps, at least three BVA steps and at least three NVA steps

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Waste analysis

"All we are doing is looking at the time line, from the moment the customer gives us an order to the point when we collect the cash.
And we are reducing the time line by reducing the non-value-adding wastes"

Taiichi Ohno,
Toyota

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Seven sources of waste

Move
- Transportation
- Motion

Hold
- Inventory
- Waiting

Over-do
- Defects
- Over-Processing
- Over-Production

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Move

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Transportation

Send or receive materials or documents (incl. electronic) taken as input or output by the process activities

Example

University admission process: to apply for admission at a university, students fill in an online form. When a student submits the online form, a PDF document is generated. The student is requested to download it, sign it, and send it by post together with the required documents:

1. Certified copies of degree and academic transcripts

2. Results of language test

3. CV

When the documents arrive at the admissions office, an officer checks their completeness. If a document is missing, an e-mail is sent to the student. The student has to send the missing documents by e-mail or post depending on document type.

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Motion

- Motion of resources internally within the process
- Common in manufacturing processes, less common in service processes

Examples

- Vehicle inspection process: a process worker moves with the inspection forms from one inspection base to another; in some cases inspection equipment also needs to be moved around

- Application-to-approval process: a process worker moves around the organization to collect signatures

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Hold

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Inventory

- Materials inventory
- Work-in-process (WIP)

Examples
- Vehicle inspection process: when a vehicle does not pass the first inspection, it is sent back for adjustments and left in a pending status. At a given point in time, about 100 vehicles are in the "pending" status across all inspection stations
- University admission process: About 3000 applications are handled concurrently

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Waiting

- Task waiting for materials or input data
- Task waiting for a resource
- Resource waiting for work (resource idleness)

Examples

- Vehicle inspection process: A technician at a base of the inspection station waiting for the next vehicle
- Application-to-Approval process: Request waiting for approver
- University admission process: Incomplete application waiting for additional documents; batch of applications waiting for committee to meet

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Over-do

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Defects

- Correcting or compensating for a defect or error
- Rework loops

Examples

- <u>Vehicle inspection process</u>: A vehicle needs to come back to a station due to an omission
- <u>Travel approval process</u>: Request sent back to requestor for revision
- <u>University admission process</u>: Application sent back to applicant for modification; request needs to be re-assessed later due to incomplete information

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Over-processing

- Tasks performed unnecessarily given the outcome of the process
- Unnecessary perfectionism

Examples

- <u>Vehicle inspection process</u>: technicians take time to measure vehicle emissions with higher accuracy than required, only to find that the vehicle clearly does not fulfill the required emission levels
- <u>Travel approval process</u>: 10% of approvals are trivially rejected at the end of the process due to lack of budget
- <u>University admission process</u>: Officers spend time verifying the authenticity of degrees, transcripts and language test results. In 1% of cases, these verifications uncover issues. Verified applications are sent to the admissions committee. The admission committee accepts 20% of the applications it receives

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Over-production

- Unnecessary process instances are performed, producing outcomes that do not add value upon completion

Examples
- Quote-to-cash process: In 50% of cases, issued quotes do not lead to an order
- Travel approval process: In 5% of cases, travel requests are approved but the travel is cancelled
- University admission process: About 3000 applications are submitted, but only 600 are considered eligible after assessment

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Equipment rental process: wastes
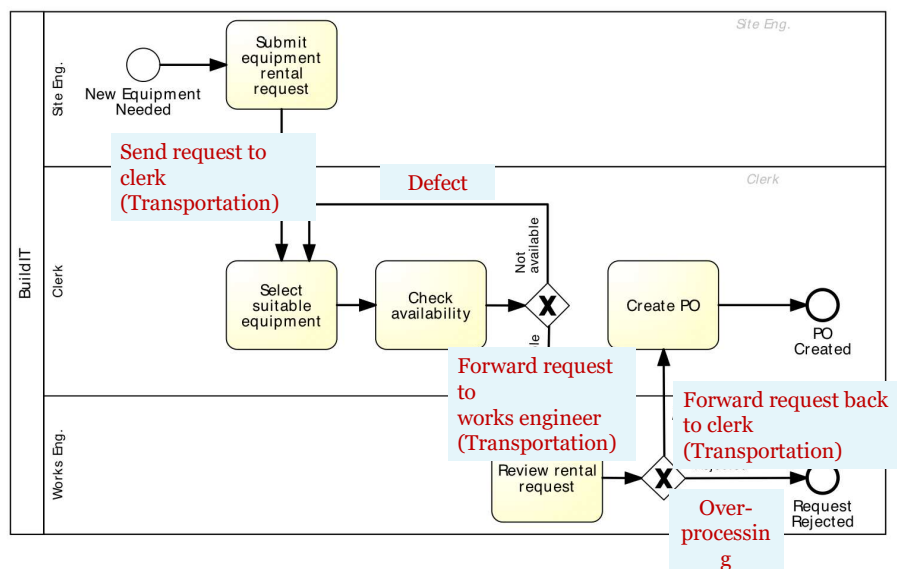
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Equipment rental process: wastes

Transportation

- Site engineer sends request to clerk
- Clerk forwards to works engineer
- Works engineer sends back to clerk

Inventory

- Equipment kept longer than needed

Waiting

- Waiting for availability of works engineer to approve

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Equipment rental process: wastes

Defect

- Selected equipment not available, alternative equipment sought
- Incorrect equipment delivered and returned to supplier

Over-processing

- Clerk finds available equipment and rental request is rejected by works engineer
- Rental requests being approved and then canceled by site engineer because no longer needed

Over-production

- Equipment being rented and not used at all by site engineer
- Equipment returned by site engineer because is incorrect

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Identifying and documenting process issues

- **Issue register**: allows us to document issues and their impact in a structured manner
- **Pareto analysis and PICK charts**: allow us to select a subset of issues for further analysis and redesign.

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Issue Register Example

| Name	Explanation	Assumptions	Qualitative Impact	Quantitative Impact
Equipment kept longer than needed	Site engineers keep equipment longer than needed via deadline extensions	3000 pieces of equipment rented p.a. In 10% of cases, equipment kept two days longer than needed. Rental cost is 100 per day		$0.1 \times 3000 \times 2 \times 100 = 60,000$ p.a.
Rejected equipment	Site engineers reject delivered equipment due to non-conformance to their specifications	3000 pieces of equipment rented p.a. 5% of them are rejected due to an internal mistake For each equipment rejected due to an internal mistake, BuildIT is billed 100.	Disrupted schedules. Employee stress and frustration	$3000 \times 0.05 \times 100 = 15,000$ p.a.
Late payment fees	Late payment fees incurred because invoices are not paid by their due date	3000 pieces of equipment rented p.a. Average rental time is 4 days Rental cost is 100 per day. Each rental leads to one invoice. About 10% of invoices are paid late. Penalty for late payment is 2%.	Poor reputation with suppliers	$0.1 \times 3000 \times 4 \times 100 \times 0.02 = 2400$ p.a.

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Pareto chart

- Useful to prioritize a collection of issues
- Bar chart where the height of the bar denotes the impact of each issue
- Bars sorted by impact
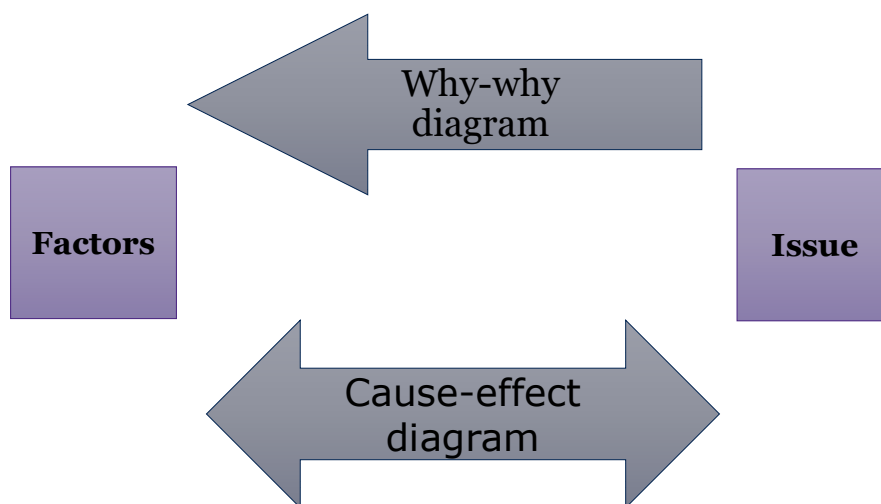- Superposed curve of cumulative percentage impact

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Pareto chart example
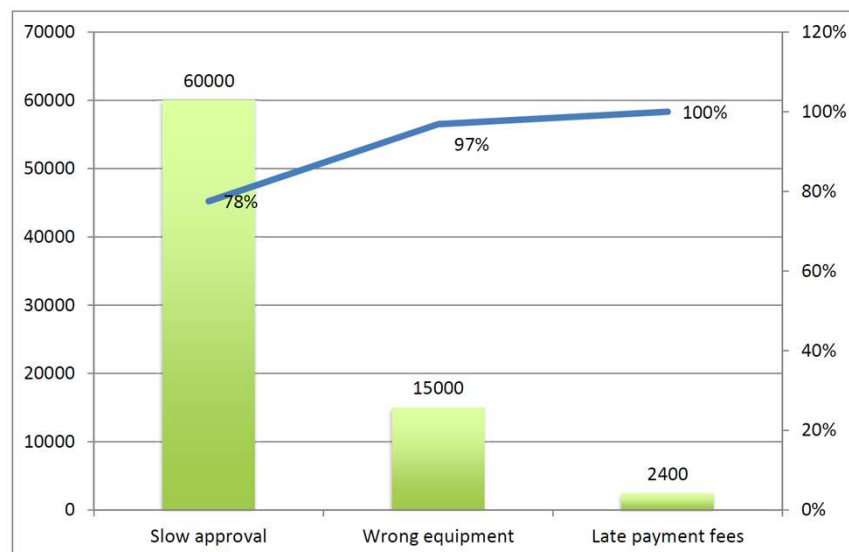
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Exercise

- Pharmacy prescription process (Exercise 1.6)
  - Identify and document at least two issues in an issue register
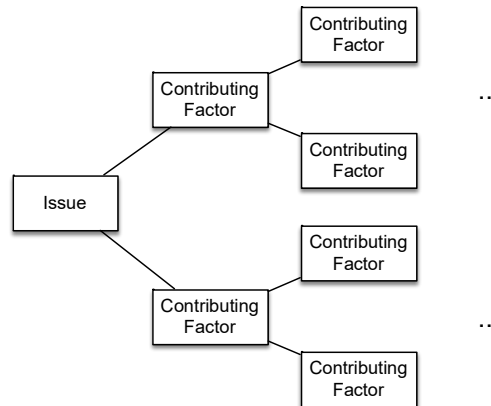
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Root-cause analysis

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Why-why diagram

Five levels of nesting - "Five Why's"

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Why-why diagram example

Site engineers keep equipment longer, why?
- Site engineer fears that equipment will not be available later when needed, why?
  - time between request and delivery too long, why?
    - excessive time spent in finding suitable equipment and approving the request, why?
      - time spent by clerk contacting possibly multiple suppliers sequentially;
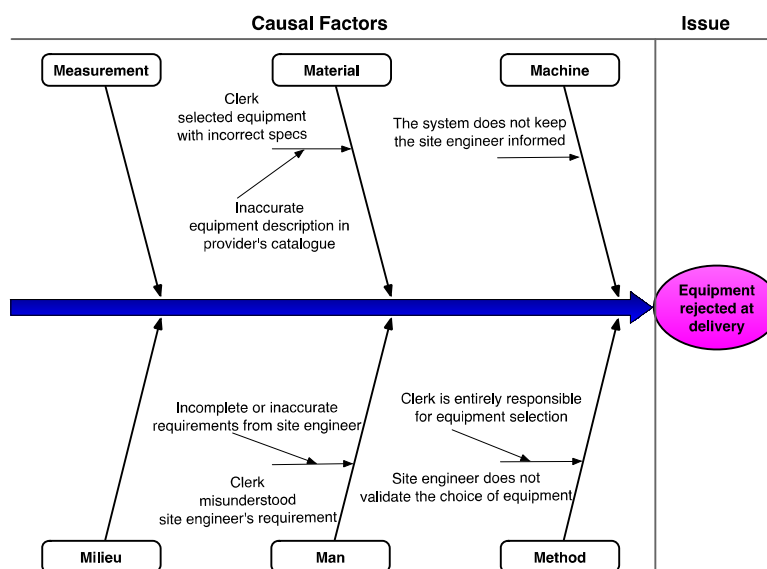   - time spent waiting for works engineer to check the requests;

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Cause-effect (Fishbone) diagram
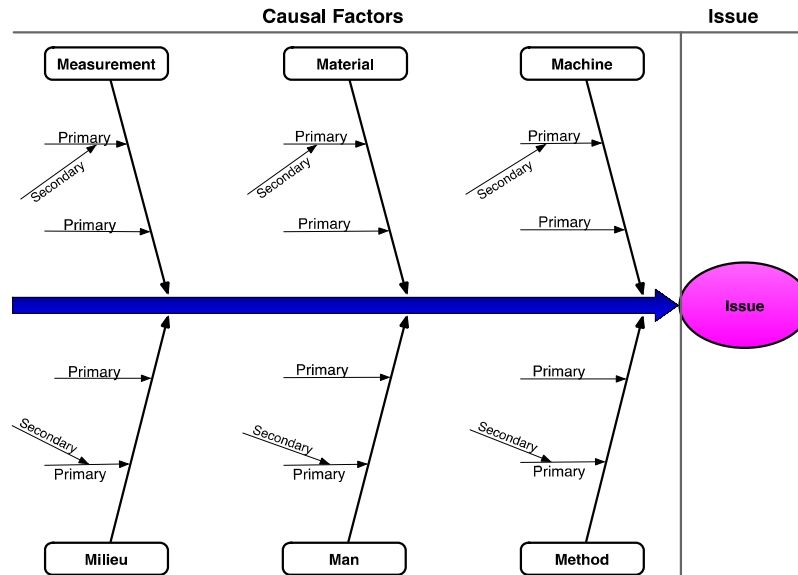
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Cause-effect diagram example

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