

PURDUE

UNIVERSITY

Davidson School of
Chemical Engineering



Developing a working design chart for standardizing PHA template

A ChE59700 Capstone Project presentation.

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Contents.

- Introduction
- Review of current PHAs
- PHA header superset
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Introduction.

- Hazards in operating an industry.
- Risk assessment studies.
- Process Hazard Analysis (PHA).
- Drawbacks of current PHA.



Introduction.

- Hazard evaluation – Hazard analysis & risk assessment.
- Hazard & operability studies and process hazard checklists.
- Probabilistic and quantitative risk assessments.



Review of current PHA's.

- No uniformity.
- Subject to frequent changes.
- Data not reusable.
- Very difficult to automate the process of risk assessment.

Deviation	Causes	Consequences	Safeguards	P	A	E	R	Recommendation	By



PHA header superset

- PHA header
- PHA header superset
- Misconceptions regarding PHA header superset
- Advantages of using PHA header superset



PHA header superset

Tag No.	Item Name	Item tag	Deviation	Consequence						
				Consequences	Severity-Safety	Conditional Modifier-Safety	Modifier credit	Severity-Envi	Conditional modifier-Envi	Modifier credit

Initiating Event	Likelihood Category (Risk Matrix)			Independent Protection Layers			Unmitigated Risks (All causes, OOM)
	S	L	RR	IPL's	IPL category	IPL credit	

Required SIL (All causes)	Required EIL (All causes)	Selected SIL	Selected EIL	Recommendations (SIL)	Comments	Compiled By	Date
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Databases

Databases are storage locations that hold data in a specified structured format. The planned software needs 3 different databases mentioned below:

- Item name – Tag database.
- Tag based parameters database.
- Temporary database for data download.



Item name – Tag database

This database contains data correlating every item name to a specific tag.

Tag	Item name
Tank	Atmospheric storage tank
	Nitrogen blanketed tank
	High pressure storage tank
	Jacketed storage tank



Tag based parameters database

This database holds the data for auto filling the PHA spreadsheet for the given item. This is done based on data stored in a tag based system.

Tag	Deviation	Consequence	Initiating event
Tank	Tank rupture.	Material release.	Over pressure.
	Tank rupture.	Material release	Corrosion.
	Tank collapse.	Compromised integrity	Vacuum pressure.



Temporary database for data download

- Used as a location to download data to from online sources.
- Has same structure as the PHA spreadsheet.
- All data stored in this is temporary and will be deleted after being copied to PHA spreadsheet.



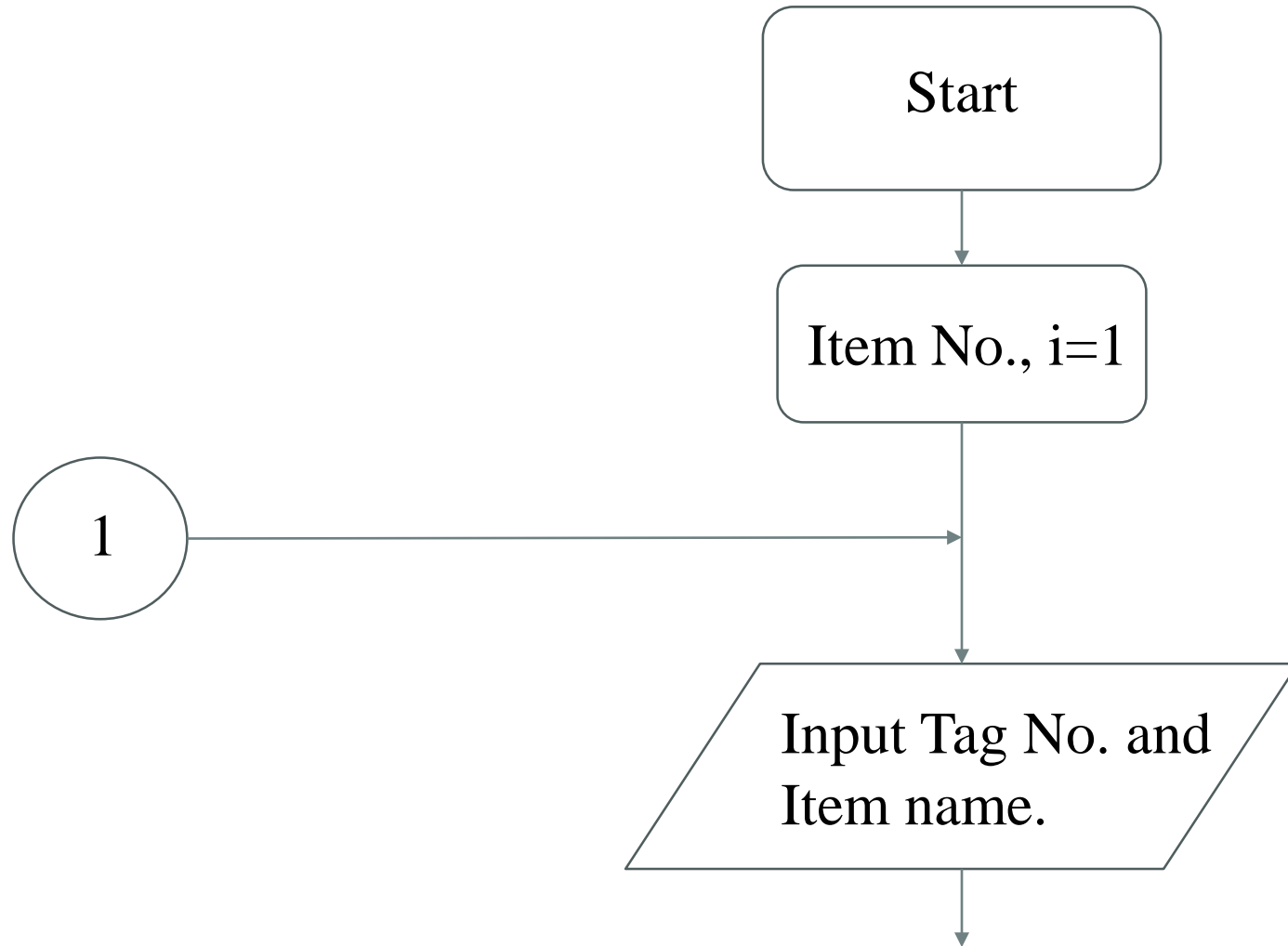
Flowchart

Flowchart is a diagram that shows the pathway followed by the software in a step-by-step manner. The main objectives that needed to be achieved were:

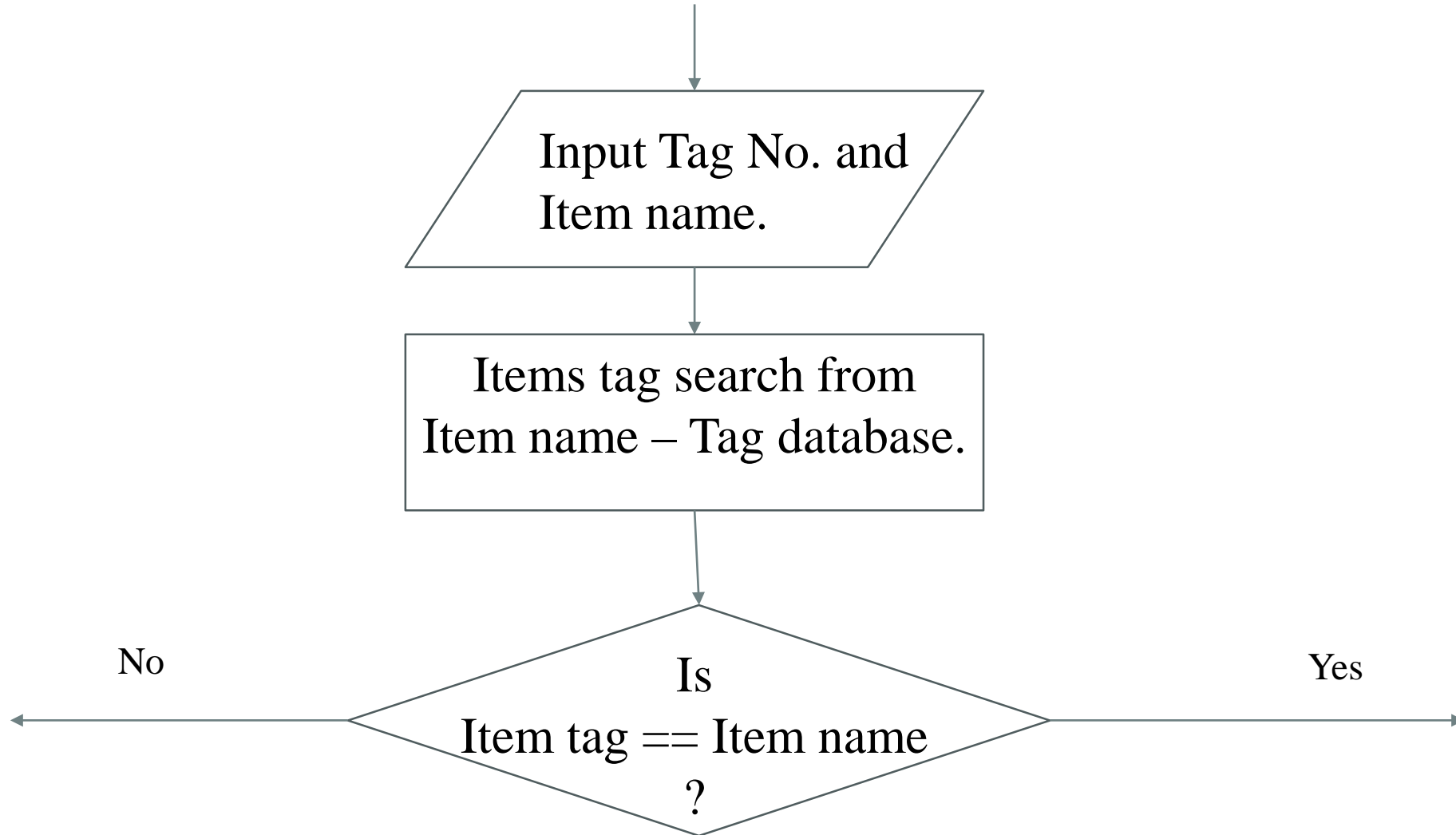
- Identify and tag the items being analyzed.
- Autofill parameters from either database or online sources.
- Update all databases.
- Hide headers deemed unnecessary by user.



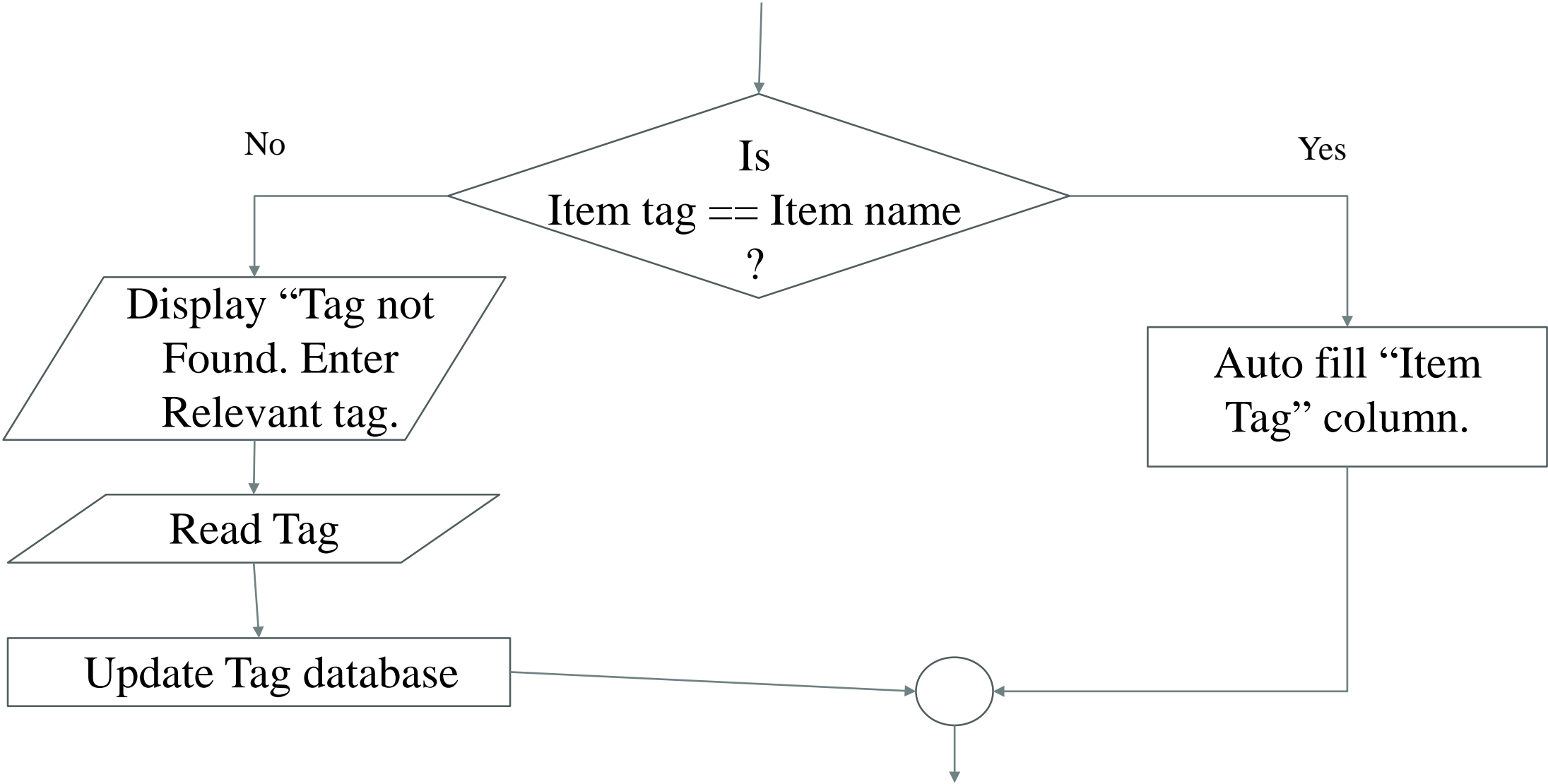
Software flowsheet



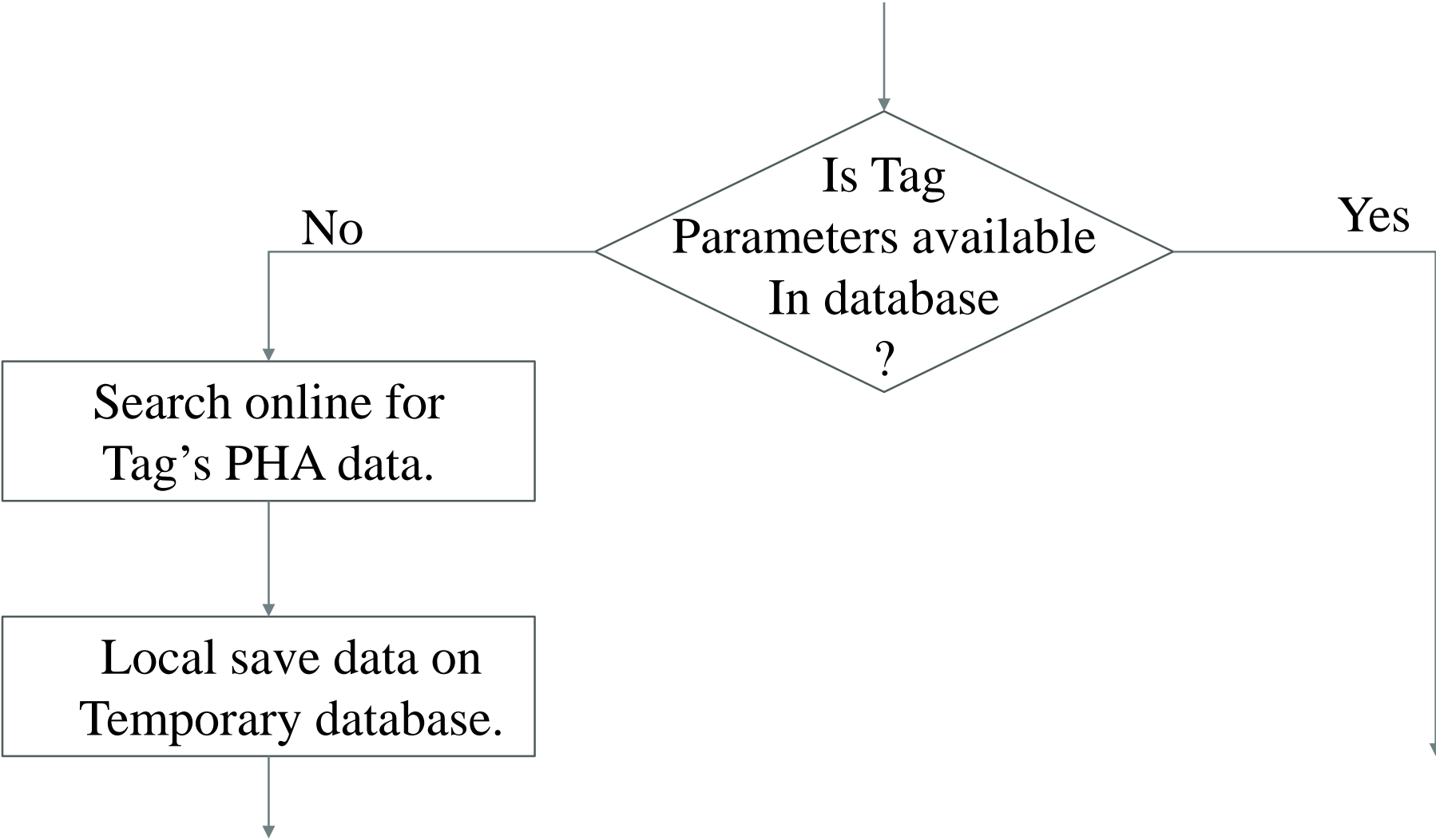
Software flowsheet



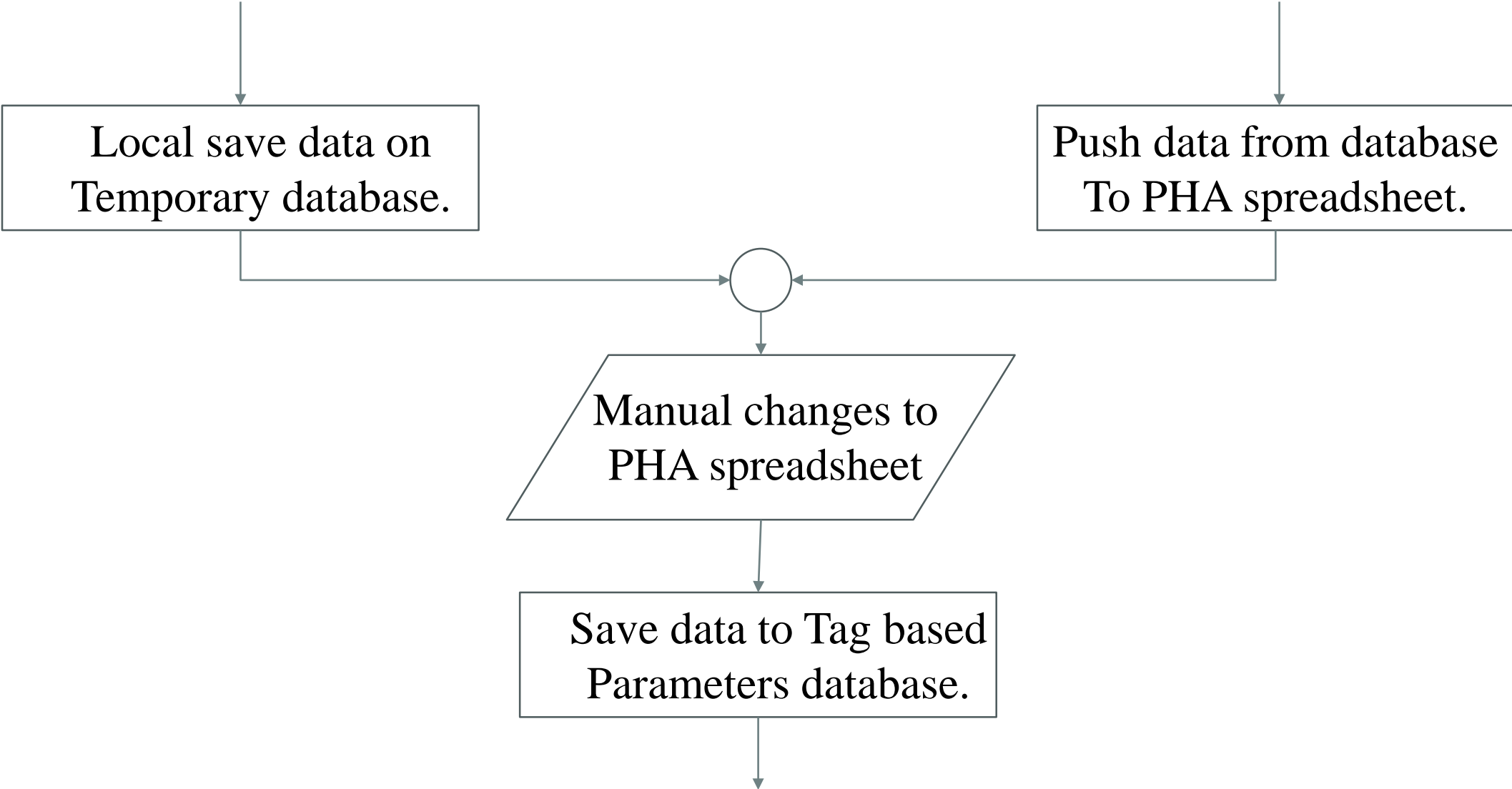
Software flowsheet



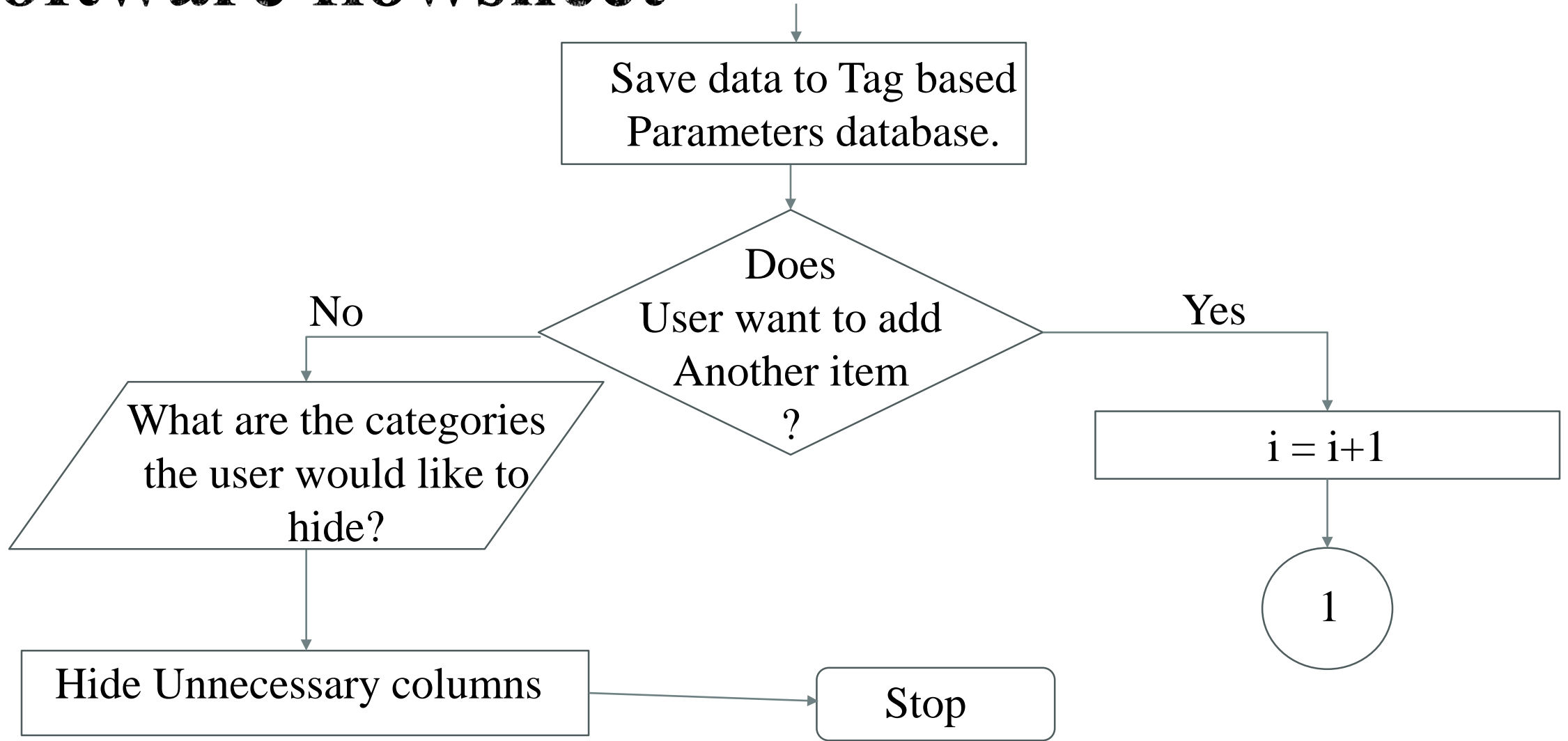
Software flowsheet



Software flowsheet



Software flowsheet



Discussions and conclusions

- Uniformity of data.
- Lower probability of error.
- Easier automation.
- Easier referencing for future works.



Discussions and conclusions

- Hurdles to implementation.
- Role of future works.
- Role of multi-plant companies
- Role of inter-company cooperation.



Scope for future work

- Adding to the PHA superset.
- Developing old PHA's into standardized template.
- Developing standard databases to support the software.
- Incorporating AI to the software to make it able to read Piping and Instrumentation Diagram (P&ID) and develop PHA on its own.



Questions?



Thank you.

