Management & Planning Tools

MCHE 201 – Spring 2019

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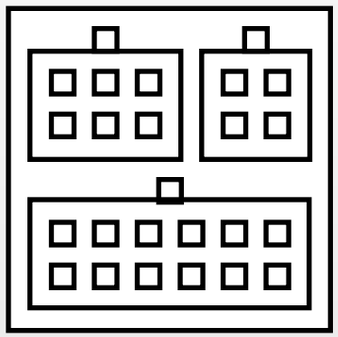
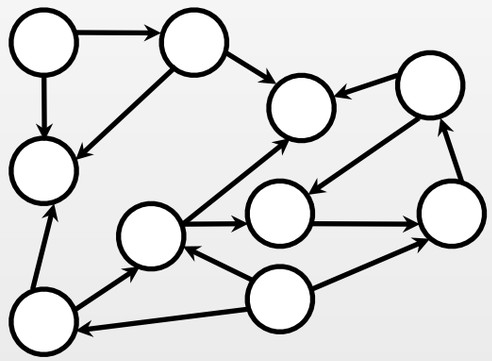
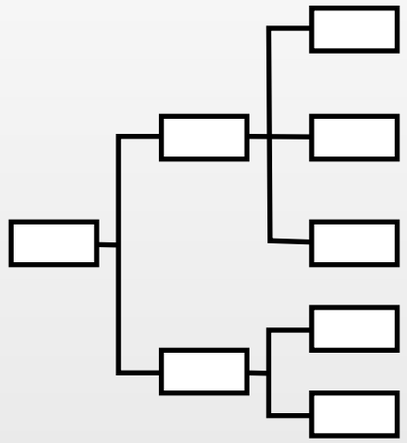
Management & Planning Tools



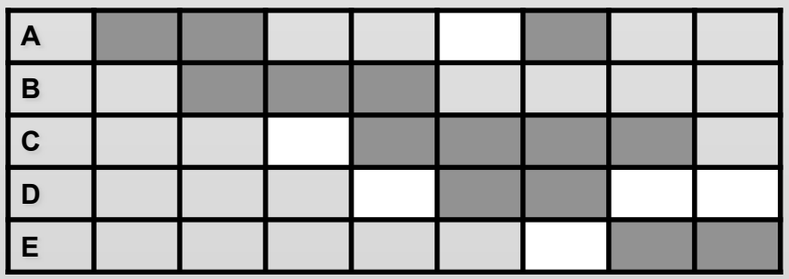
Affinity Diagram (1)



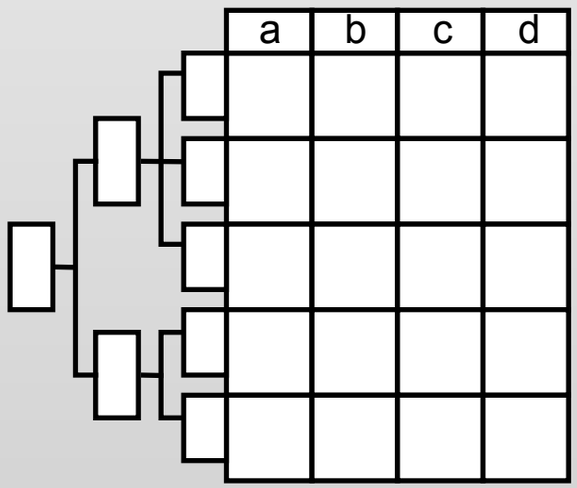
Interrelationship Diagraph (2)



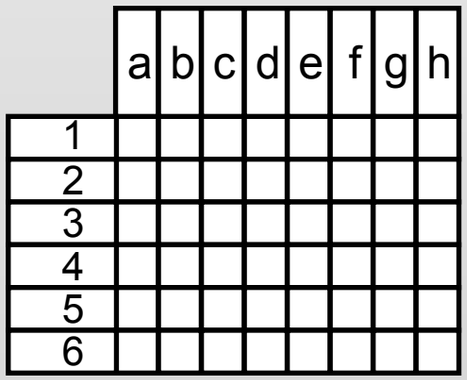
Tree Diagram (3)



Gantt Chart (4)

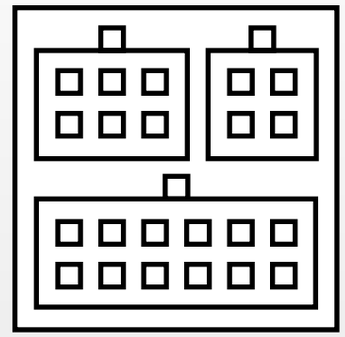


Prioritization Matrices (5)



Matrix Diagram (6)

Affinity Diagram



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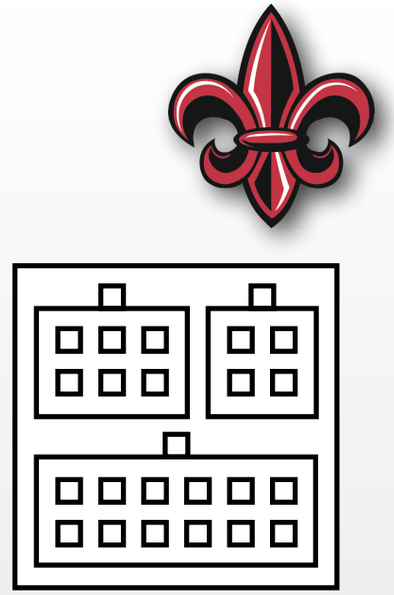

- Purpose:

Affinity Diagram

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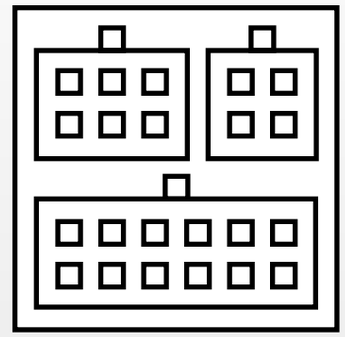
  - Creative process (generate & organize ideas)



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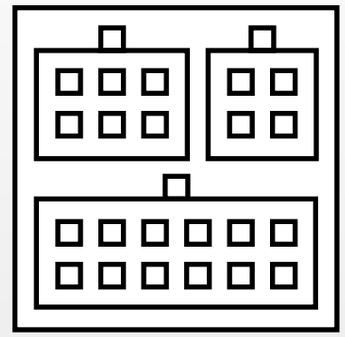
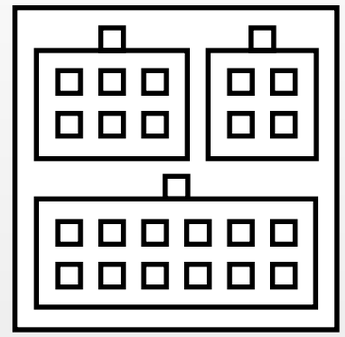


- Purpose:
  - Creative process (generate & organize ideas)

- Start with:

Affinity Diagram



- Purpose:
  - Creative process (generate & organize ideas)

- Start with:
  - What is issue under discussion?

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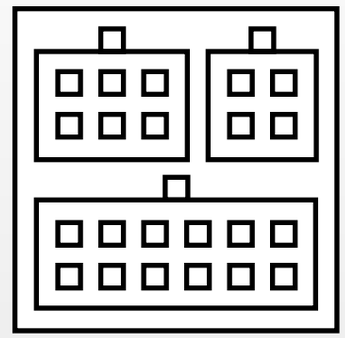

- Purpose:
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- Start with:
  - What is issue under discussion?

- Then:

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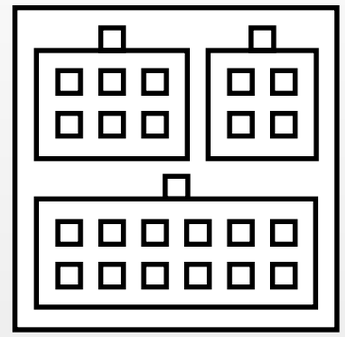

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- Start with:
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- Then:
  - Brainstorm ideas

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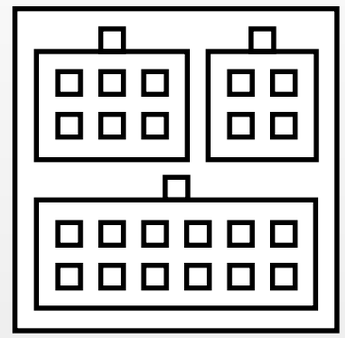

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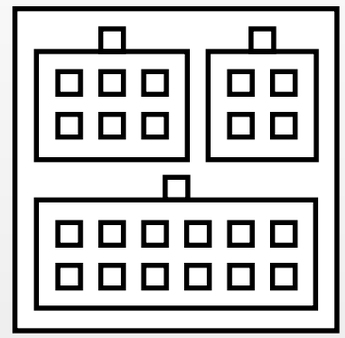


- Purpose:
  - Creative process (generate & organize ideas)

- Start with:
  - What is issue under discussion?

- Then:
  - Brainstorm ideas

- Then:
  - Gather ideas under affinity headings

Affinity Diagram Example

- Reduce Data Entry Complexity (Selling, Leasing, Tracking Products)

Affinity Diagram Example

Affinity Diagram Example

Error Prevention

Affinity Diagram Example

Error Prevention

Problem Solving

Affinity Diagram Example

Automated Entry

Display Only Critical Info. On Screen

Shorten 11-Digit Product Code

Train Clerical Sales and Customer Service Personnel

Increase Size to Increase Legibility

Error Prevention

Standardize completion Format

Improve Prompts

Problem Solving

On-Line System at Customer Site

Color Code Forms by Product Group

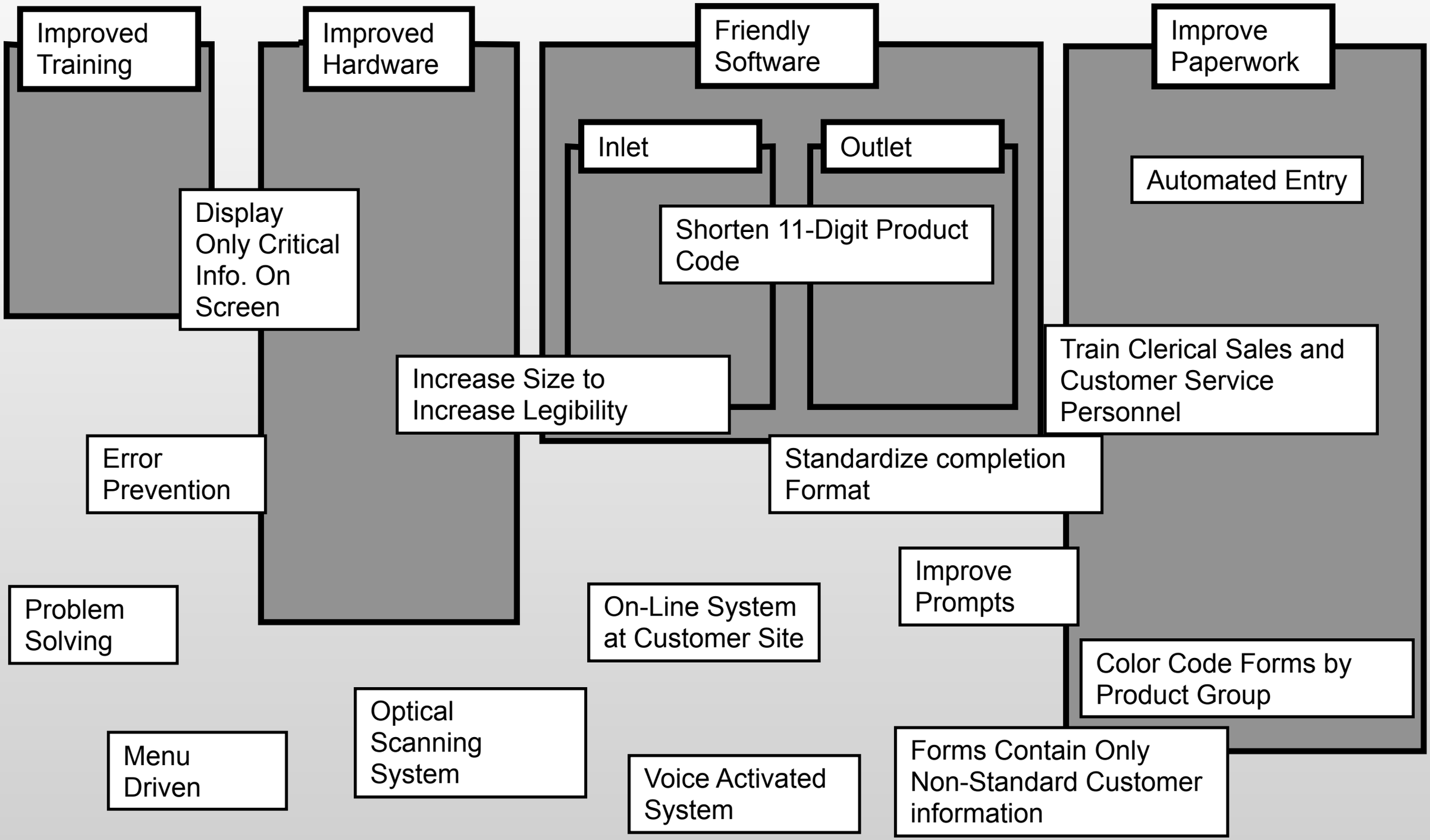
Optical Scanning System

Menu Driven

Voice Activated System

Forms Contain Only Non-Standard Customer information

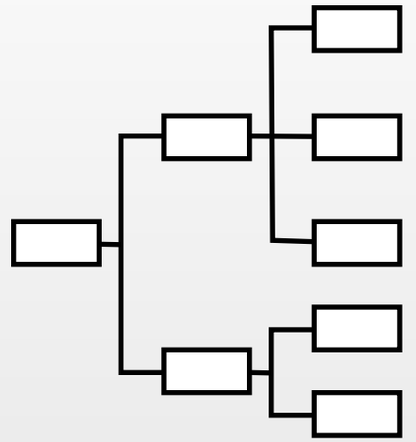
Affinity Diagram Example



Affinity Diagram Example

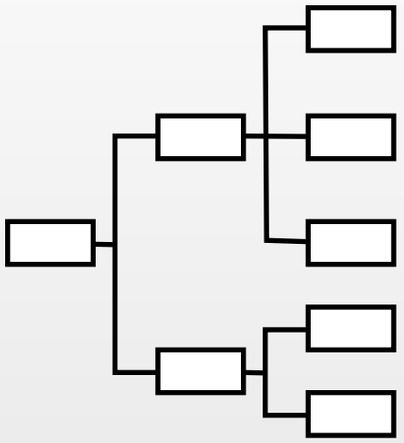
- Improved Training
  - Error Prevention
  - Problem Solving
- Improved Hardware
  - Optical Scanning System
  - On-Line System at Customer Site
  - Voice Activated System
  - Automated Entry
- Friendly Software
  - Inlet
    - Menu Driven
    - Improve Prompts
  - Outlet
    - Display Only Critical Info. On Screen
- Improve Paperwork
  - Train Clerical Sales and Customer Service Personnel
  - Shorten 11-Digit Product Code
  - Forms Contain Only Non-Standard Customer information
  - Standardize completion Format
  - Increase Size to Increase Legibility
  - Color Code Forms by Product Group

Tree Diagram (Not Function Tree)



Tree Diagram (Not Function Tree)

- Purpose:
  - Show paths and tasks to accomplish primary goal and its related sub-goals



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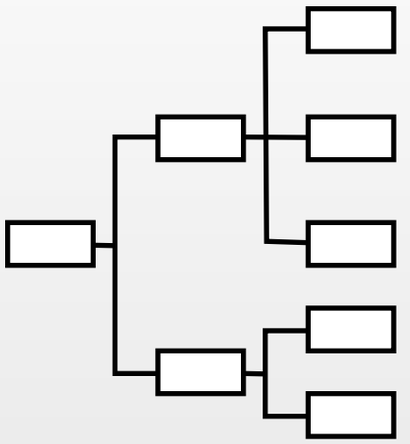

- Purpose:
  - Show paths and tasks to accomplish primary goal and its related sub-goals

- First:
  - List main what (goal)

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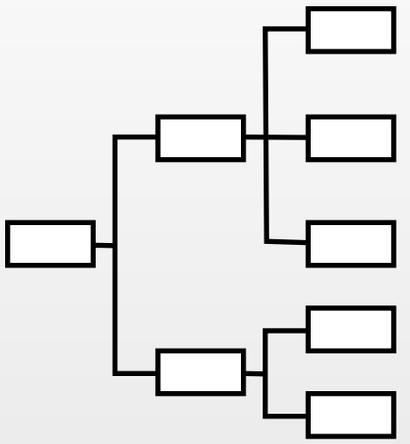

- Purpose:
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- Then:
  - List “Hows” (means)
  - These become goals (“Whats”) for next level

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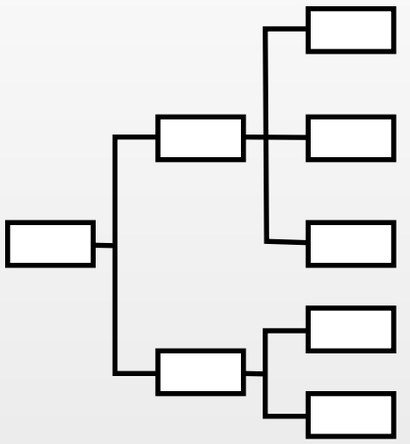

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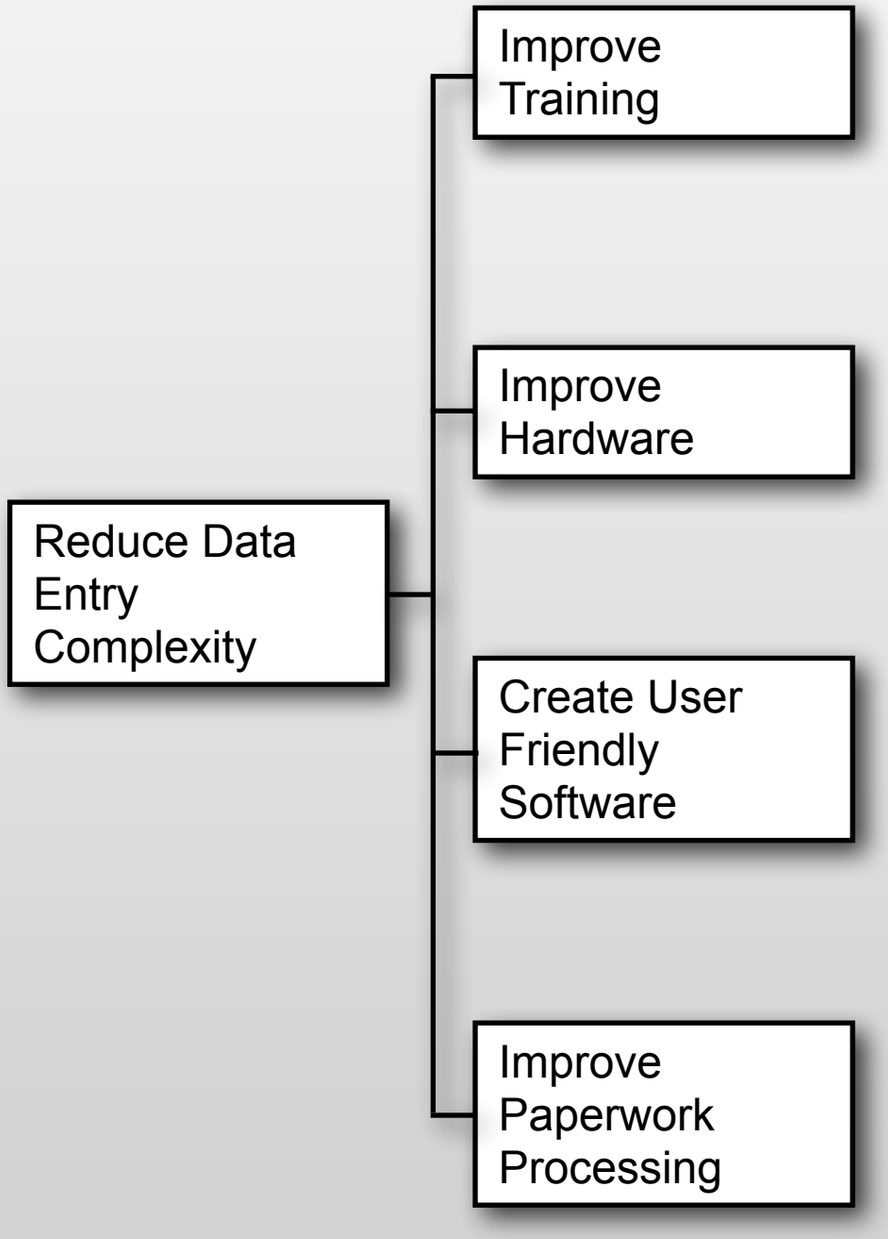
- Continue until you get to assignable tasks

Tree Diagram Example

Tree Diagram Example

Reduce Data Entry Complexity

Tree Diagram Example



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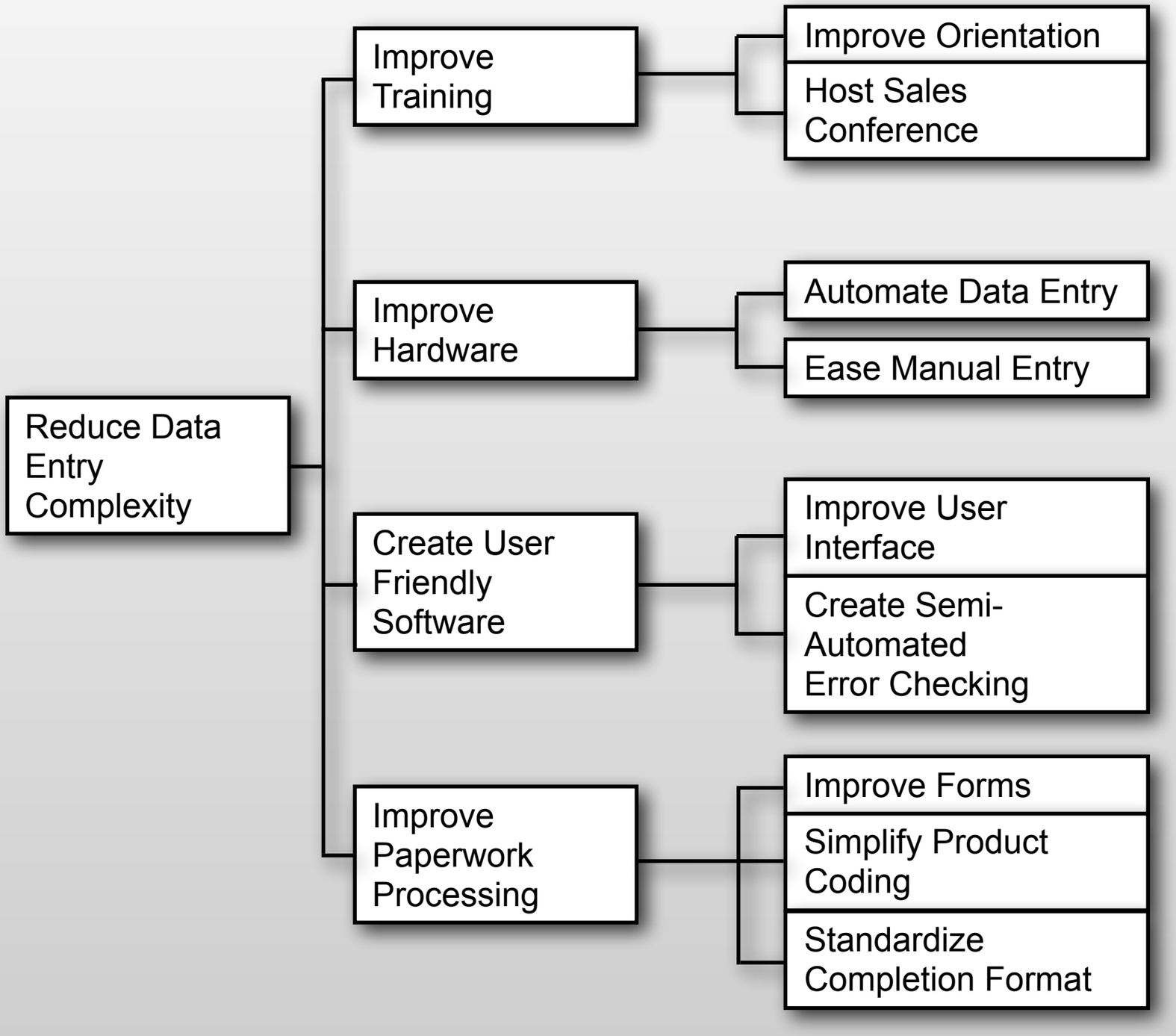

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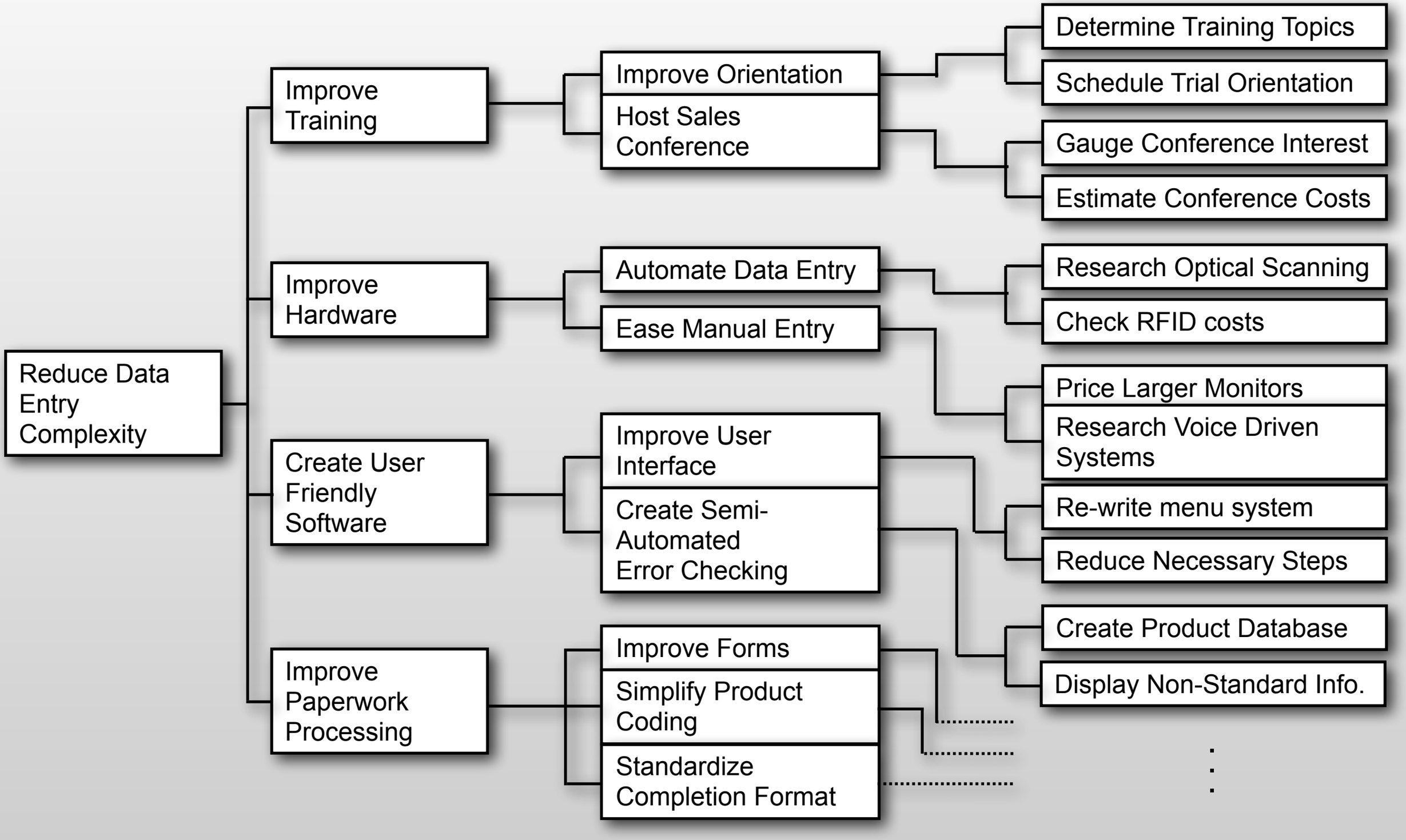
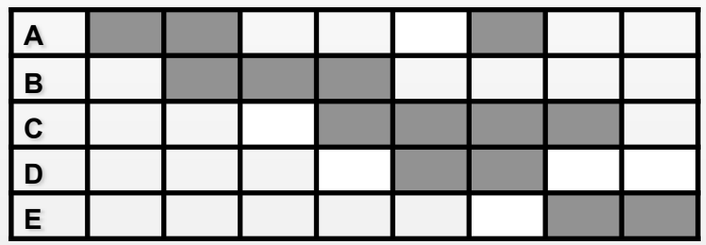


Gantt Chart



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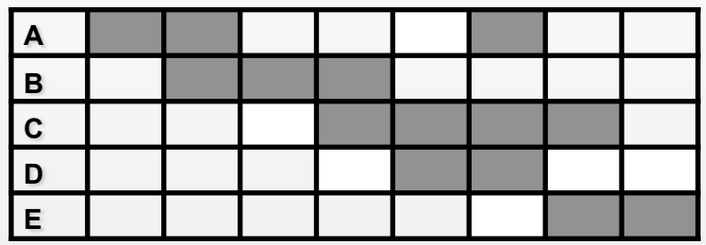
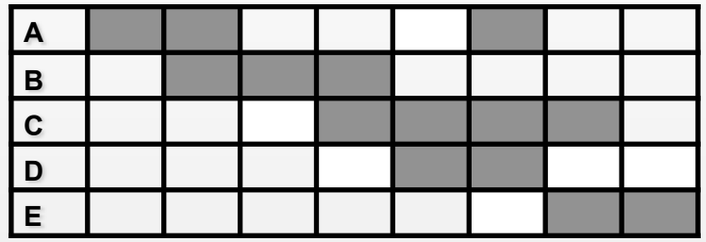


- Purpose:
  - Plan work on a project
  - Schedule work on project
  - Track project progress

Gantt Chart



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  - Identify main due dates/deadlines/milestones

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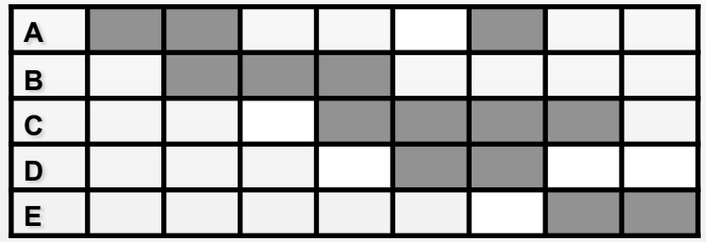

- Purpose:
  - Plan work on a project
  - Schedule work on project
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- First:
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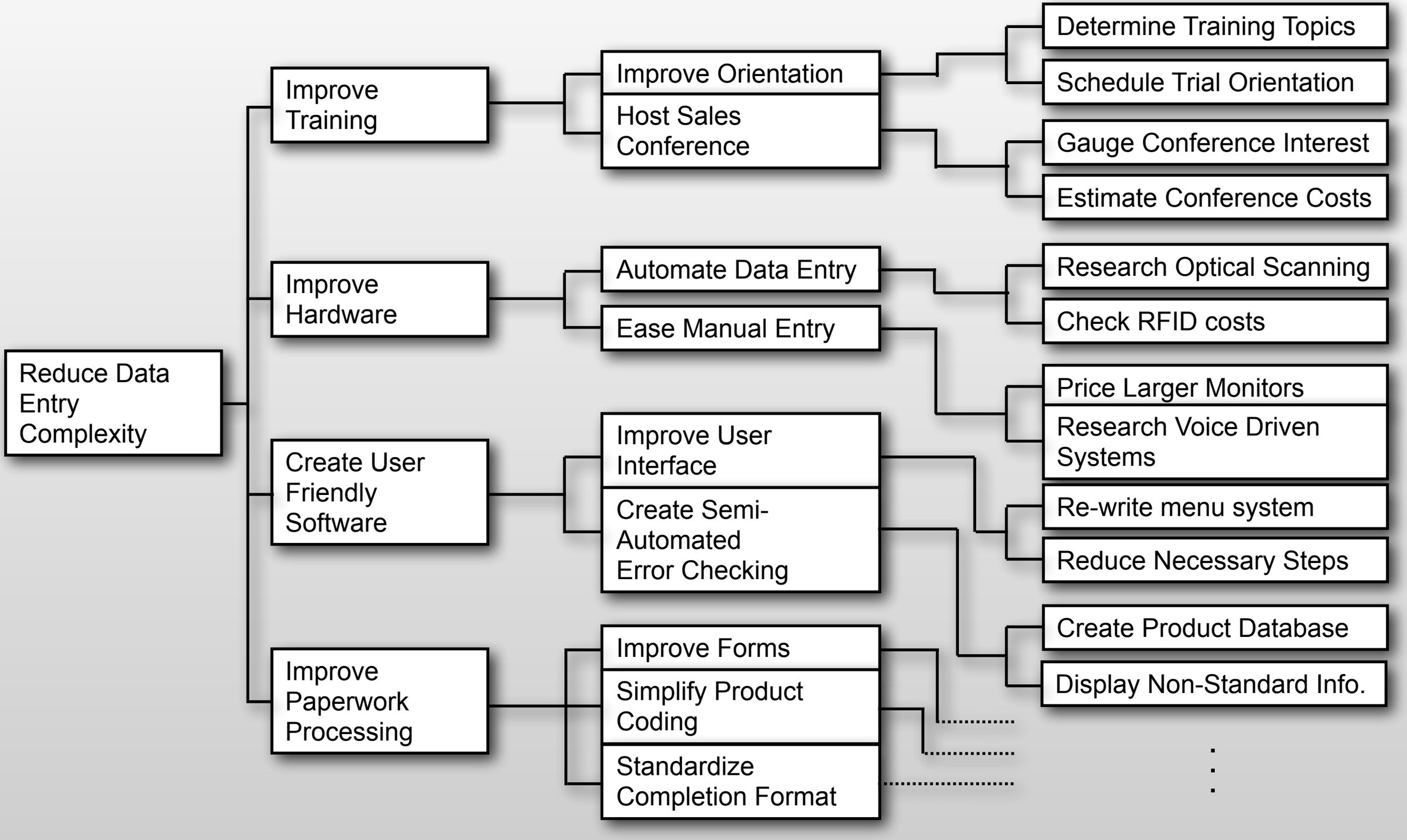
  - Identify main due dates/deadlines/milestones

- Then:
  - Work back in time
  - Set goal dates

Tree Diagram Example



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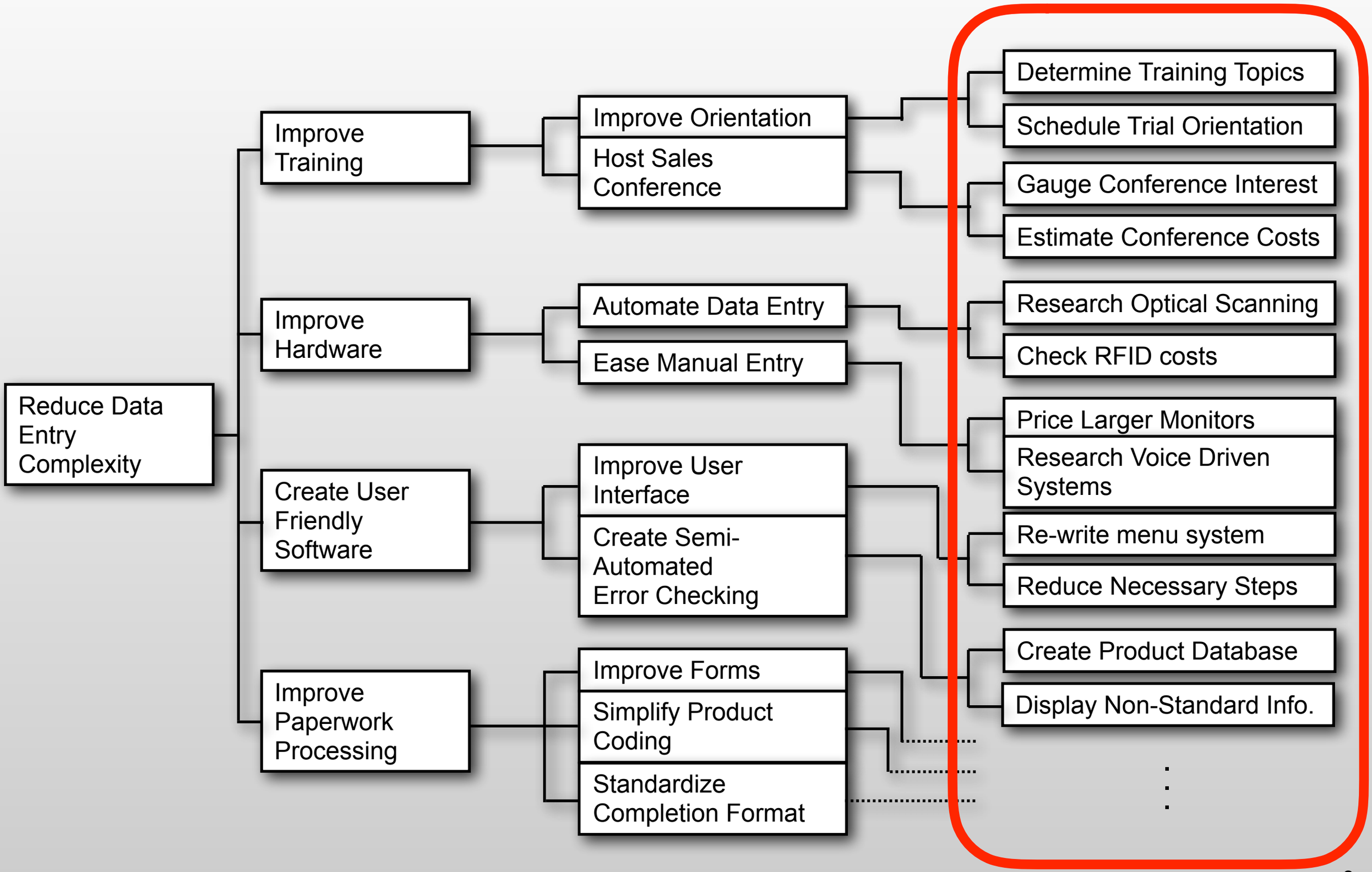

Gantt Chart Example

Task	2013	2014
Pre-Project Activities		
Advertise ARLISS Project		
Recruit Top Students		
Initial Design Activities		
Identify Key Requirements		
Conceptual Design		
Concept Prototyping and Evaluation		
Competing Prototype Construction		
Prototype Evaluation and Design Iteration		
Evaluate ARLISS Performance		
Develop Revised Conceptual Designs		
Milestones		
2014 Entry Construction Completed		♦-Aug.
2014 Competition		♦-Sept.
2014 Capstone Exhibition		Dec-♦

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Note: This example is *way* too general!

A More-detailed Example

Task	Month: J	J	A	S	O	N	D	J	F	M	A	M	J
Conceptual Design													
Refinement of customer needs and requirements													
Development of engineering specifications													
Functional decomposition													
Development of alternative concepts													
Evaluation of alternative concepts													
Concept selection													
Prototype Construction													
Develop detailed design from selected concept													
Finalize manufacturing specifications													
Finalize actuator and sensor selection													
Manufacturing/construction of prototype													
Control System Design													
Develop high-level control algorithm													
Develop/write low-level controller code													
Implement supervisory controller													
Develop User Interaction for prototype system													
Design Performance Evaluation and Refinement													
Test of prototype subsystems													
Test of full prototype with “perfect” loading													
Test of full prototype failure modes													
Refinement of mechanical design													
Refinement of control system and user interaction													
Milestones													
Contract Signed	♦- June 10												
PhD student, Seema Mallavalli, Hired		♦- July 1											
First prototype subsystem test				♦- Mid-Sept									
First full prototype tests						♦-Late Nov.							

Scheduled
Completed

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Scheduled
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Another Example

Task	Complete or Underway	Year 1	Year 2	Year 3	Year 4	Year 5
Research Plan						
Commands and Controllers						
Develop criteria for evaluation						
Develop benchmark models						
Add actuator and nonlinear dynamics						
Quantify and compare pairings						
Develop heuristics-based design process						
Develop optimal design procedure						
Experimentally evaluate designs						
Commands, Controllers, and Mechanical						
Develop benchmark models						
Add actuator and nonlinear dynamics						
Quantify and compare pairings						
Develop heuristics-based design process						
Develop optimal design procedure						
Experimentally evaluate designs						
Complete case-study for robotic arm						
Including the Human						
Obtain IRB approval for operator studies						
Crane operator study and evaluation						
Aerial lift operator study and evaluation						
Develop and implement operator study “game”						
Advantages of Robot Flexibility						
Quantify jumping performance						
Investigate jumping of more complex systems						
Evaluate concurrently designed jumping robot						
Model and control walking and running						
Quantify energy savings with compliant legs						
Education Plan						
Project-based Robotics and Controls Courses						
Robotics Tech. Elective at UL Lafayette						
Robotics-based design class						
High school inclusion in Robotics courses						
Extracurricular Robotics and Controls Projects						
ARLISS contest						
Maritime RobotX competition						
Production of Interactive Teaching Modules						
Develop interactive robotics eBooks						
Release IPython notebooks via GitHub						
Develop and Release Lab Exercises						
Undergraduate Research Experiences						
Promote undergraduate research						
Submit NSF REU proposal						
International Experiences						
Promote international collaboration						
Prepare and submit JSPS Bridge application						
Spend Summer Research in Japan						

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Creating a Gantt Chart

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- What's the goal?

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- What "sub-sub-goals"… "sub-sub-sub-goals"…

- What ***tasks*** are needed to accomplish each sub^{N}-goal?

Creating a Gantt Chart

- What's the goal?

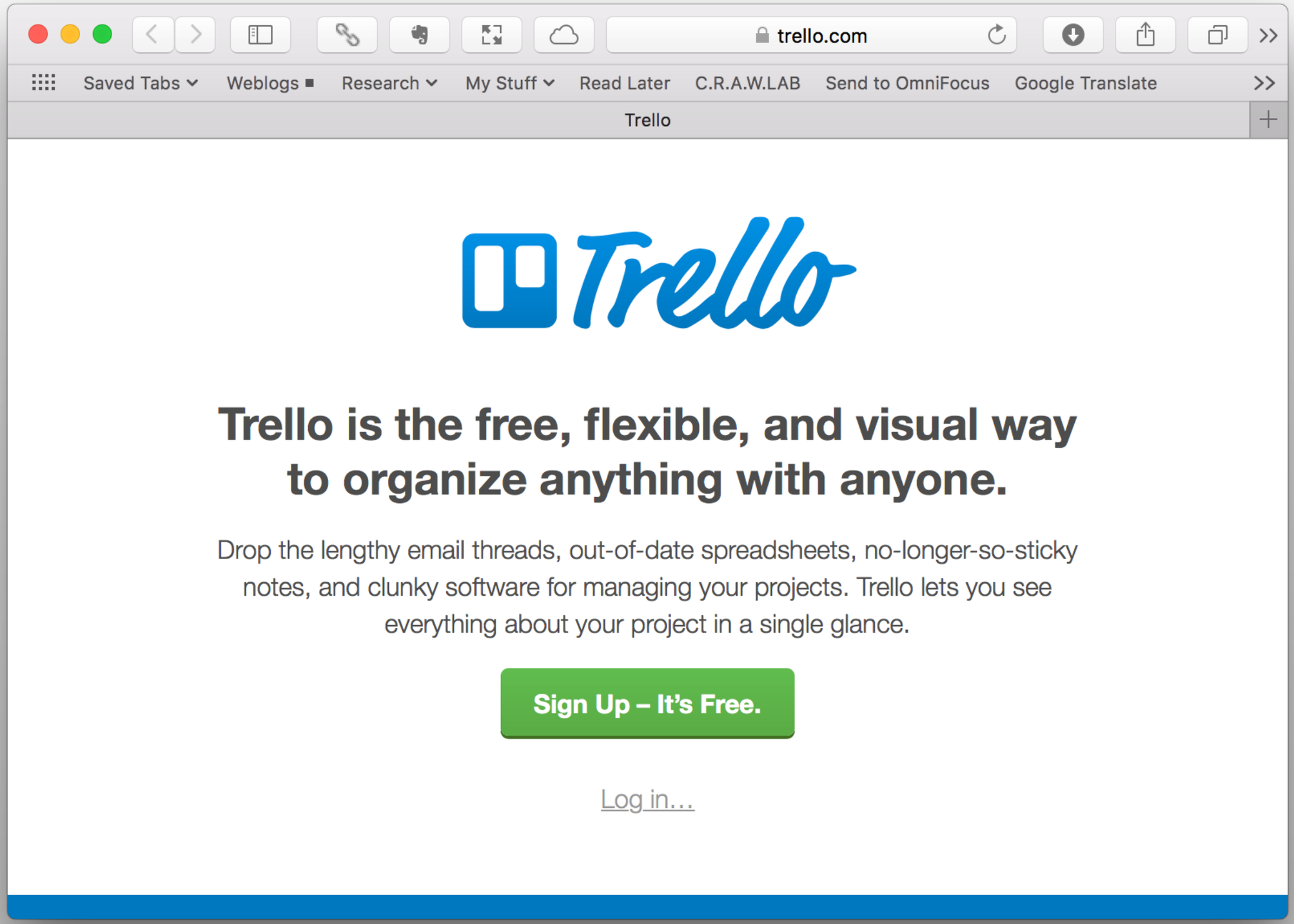
- What "sub-goals" are needed to achieve the main goal?

- What "sub-sub-goals"… "sub-sub-sub-goals"…

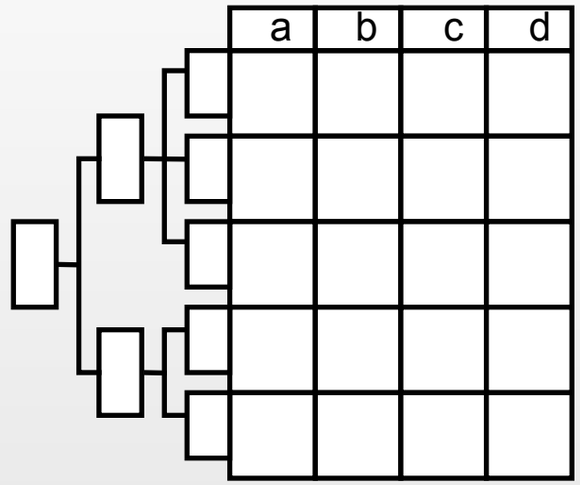
- What ***tasks*** are needed to accomplish each sub^{N}-goal?

- Include any milestones or deadlines

Online Tools Exist for This Too

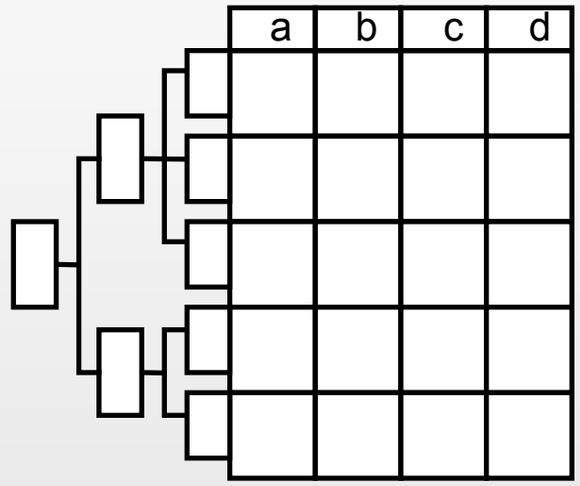


Prioritization Matrix



Prioritization Matrix

- Purpose:
  - To prioritize items:
    - ✦Prioritization against themselves
    - ✦Prioritization against criteria



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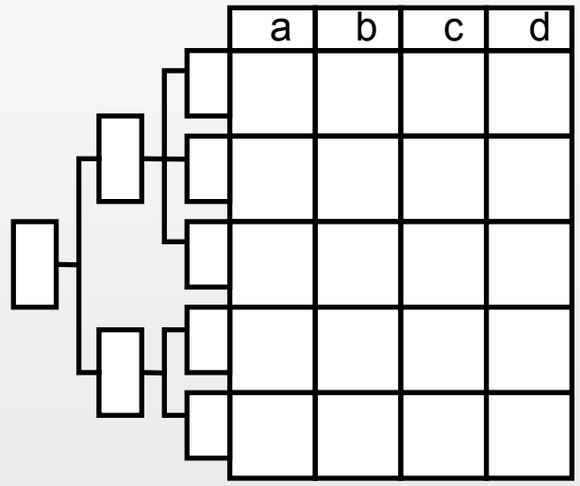

- Purpose:
  - To prioritize items:
    - ✦Prioritization against themselves
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- This allows you to focus limited resources

Prioritization Matrix (Coffee Example)

		A
Taste	A	X
Smell	B	+
Not Poisonous	C	-
Color	D	-
Temperature	E	-

Is Smell (B) more or less important than Taste (A)?

Is Not Poisonous (C) more or less important than Taste (A)?

Is Color (D) more or less important than Taste (A)?

Is Temp. (E) more or less important than Taste (A)?

Prioritization Matrix (Coffee Example)

		A	B	
Taste	A	X	-	Is Taste (A) more or less important than Smell (B)?
Smell	B	+	X	
Not Poisonous	C	-	-	Is Not Poisonous (C) more or less important than Smell (B)?
Color	D	-	-	Is Color (D) more or less important than Smell (B)?
Temperature	E	-	-	Is Temp. (E) more or less important than Smell (B)?

Prioritization Matrix (Coffee Example)

		A	B	C
Taste	A	X	-	+
Smell	B	+	X	+
Not Poisonous	C	-	-	X
Color	D	-	-	-
Temperature	E	-	-	+

Is Taste (A) more or less important than Not Poisonous (C)?

Is Smell (B) more or less important than Not Poisonous (C)?

Is Color (D) more or less important than Not Poisonous (C)?

Is Temp (E) more or less important than Not Poisonous (C)?

Continue filling the chart this way…

Prioritization Matrix (Coffee Example)

		A	B	C	D	E
Taste	A	X	-	+	+	+
Smell	B	+	X	+	+	+
Not Poisonous	C	-	-	X	+	-
Color	D	-	-	-	X	-
Temperature	E	-	-	+	+	X

Prioritization Matrix (Coffee Example)

		A	B	C	D	E
Taste	A	X	-	+	+	+
Smell	B	+	X	+	+	+
Not Poisonous	C	-	-	X	+	-
Color	D	-	-	-	X	-
Temperature	E	-	-	+	+	X

+= 5 - = 1/5

Prioritization Matrix (Coffee Example)

		A	B	C	D	E			%
Taste	A	X	-	+	+	+	$\Sigma R_1/\Sigma C$	0.2923	29.23
Smell	B	+	X	+	+	+	$\Sigma R_2/\Sigma C$	0.3846	38.46
Not Poisonous	C	-	-	X	+	-	$\Sigma R_3/\Sigma C$	0.1077	10.77
Color	D	-	-	-	X	-	$\Sigma R_4/\Sigma C$	0.0154	1.54
Temperature	E	-	-	+	+	X	$\Sigma R_5/\Sigma C$	0.2000	20.00
							52 / ΣC		
								Total	100.00

+= 5 - = 1/5

Matrix Diagram

	a	b	c	d	e	f	g	h
1								
2								
3								
4								
5								
6								

Matrix Diagram

- Purpose:
  - To show relations between two sets
  - To show strength of relations

	a	b	c	d	e	f	g	h
1								
2								
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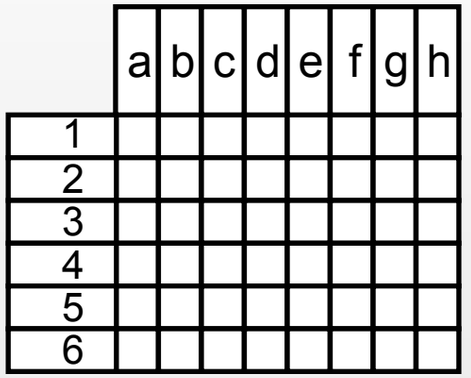
Matrix Diagram



- Purpose:
  - To show relations between two sets
  - To show strength of relations

- Basic types
  - QFD
  - Job responsibilities

Matrix Diagram (Interview Example)

	Boss	Organizer	Staff Person
Travel			
Pick Date			
Schedule			
Benefits Discussion			
Dinner			
Follow-up			

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	Boss	Organizer	Staff Person
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Primary Responsibility	★
Secondary Responsibility	☀
Needs to Know	☎

Matrix Diagram (Interview Example)

	Boss	Organizer	Staff Person
Travel	☎	★	★
Pick Date			
Schedule			
Benefits Discussion			
Dinner			
Follow-up			

Primary Responsibility	★
Secondary Responsibility	☀
Needs to Know	☎

Matrix Diagram (Interview Example)

	Boss	Organizer	Staff Person
Travel	☎	★	★
Pick Date	☀	★	☎
Schedule			
Benefits Discussion			
Dinner			
Follow-up			

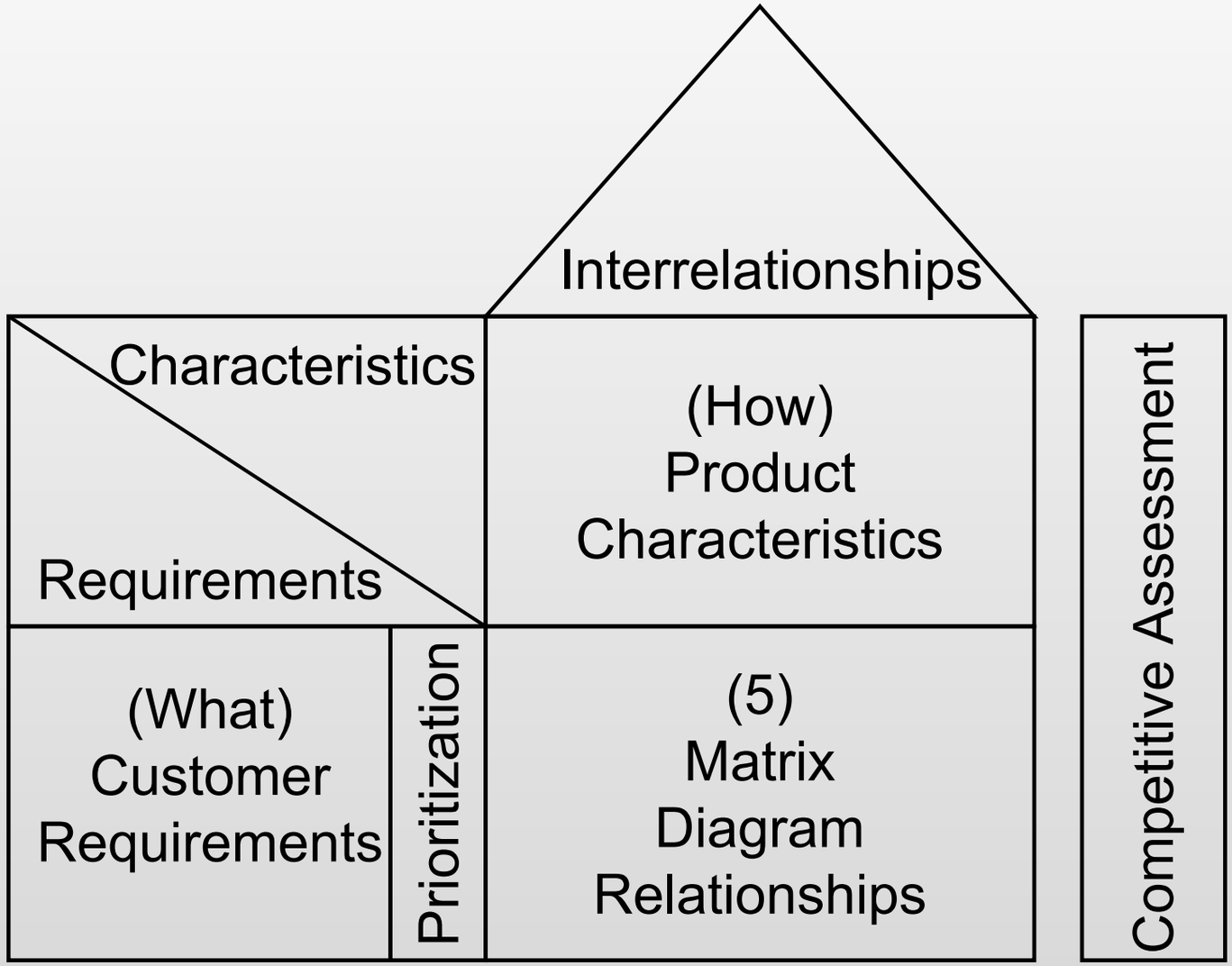
Primary Responsibility	★
Secondary Responsibility	☀
Needs to Know	☎

Matrix Diagram (Interview Example)

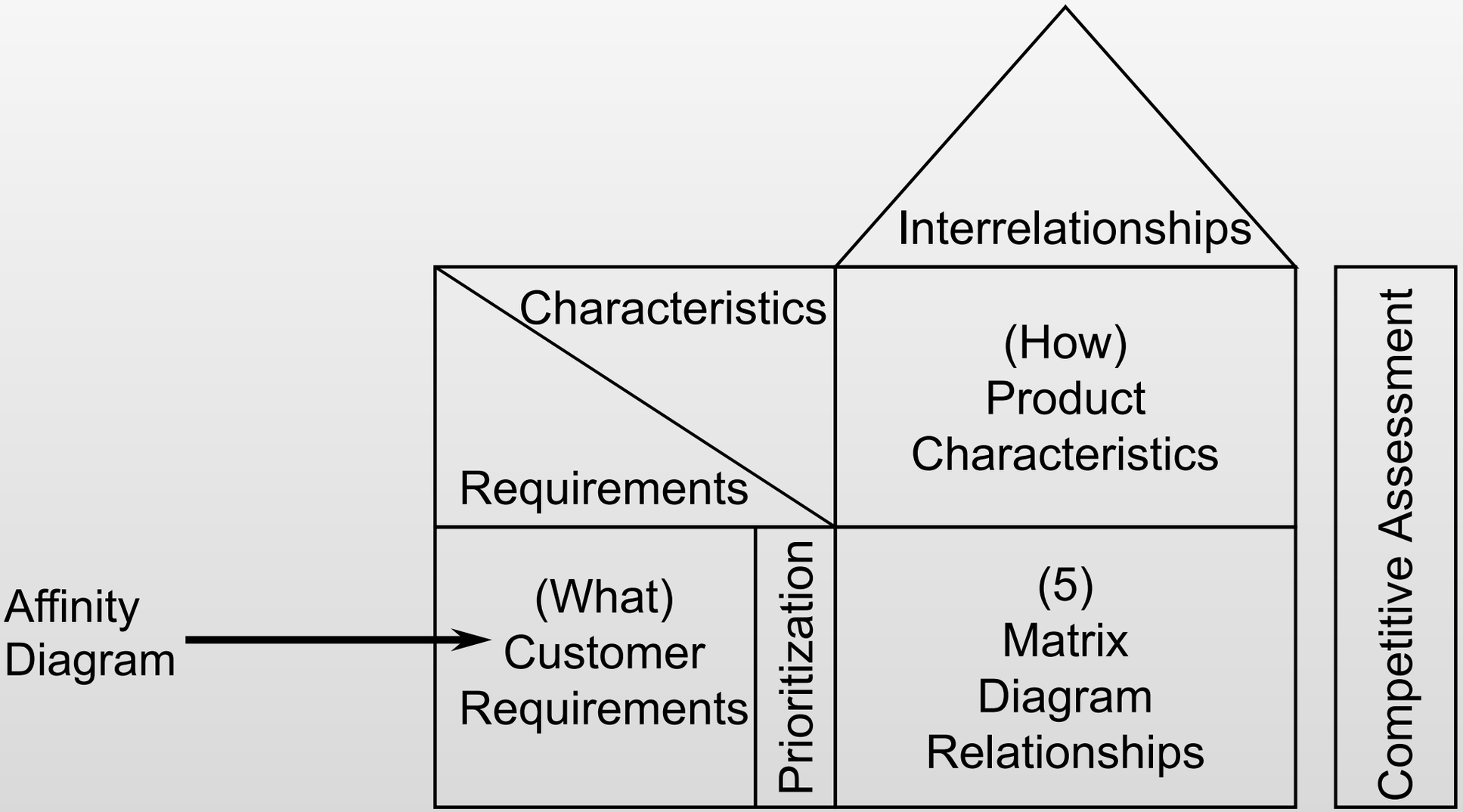
	Boss	Organizer	Staff Person
Travel	☎	★	★
Pick Date	☀	★	☎
Schedule	☎	★	☀
Benefits Discussion	★	☀	☎
Dinner	☀		★
Follow-up	★	☀	

Primary Responsibility	★
Secondary Responsibility	☀
Needs to Know	☎

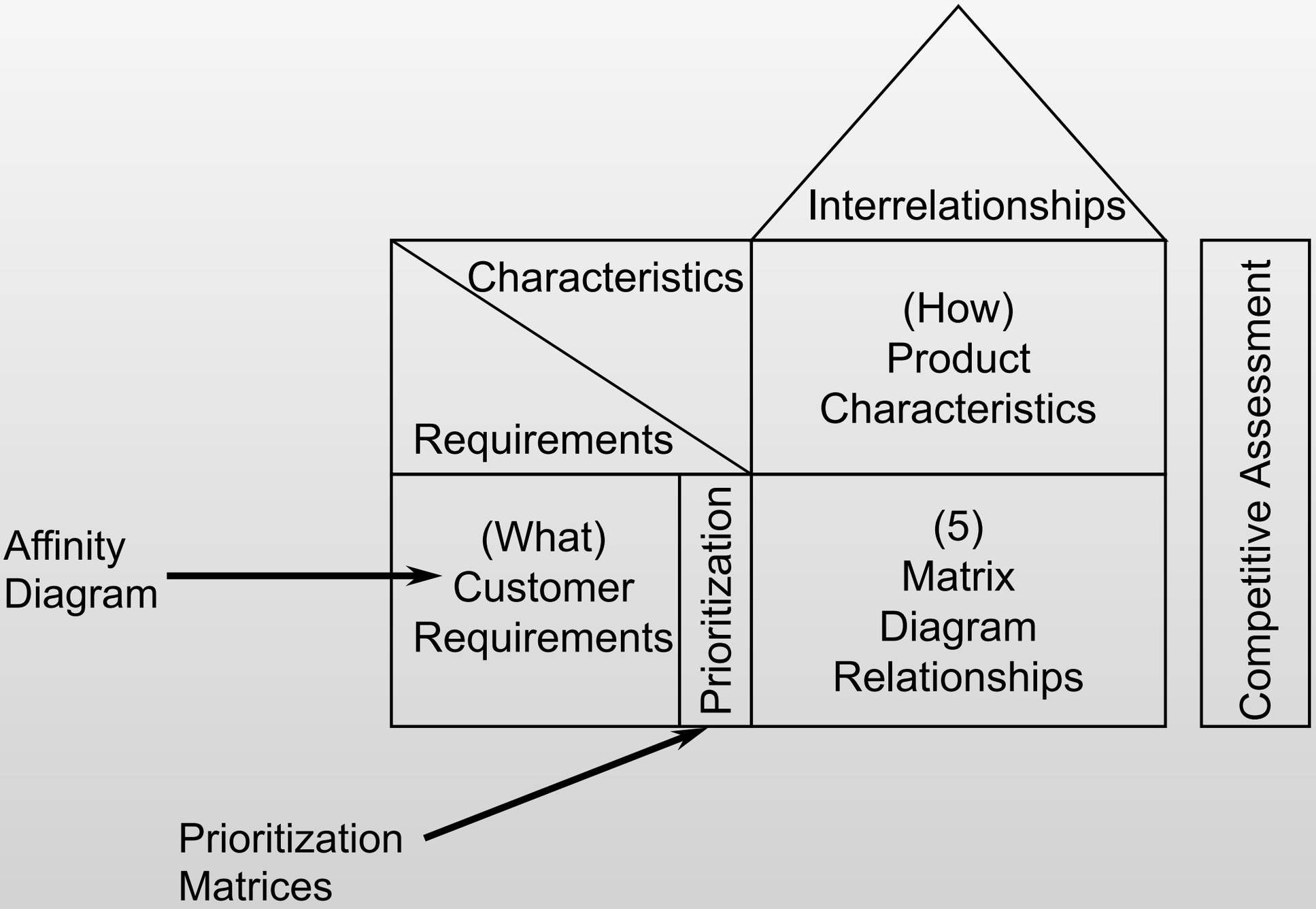
Relationship of MP Tools to HoQ



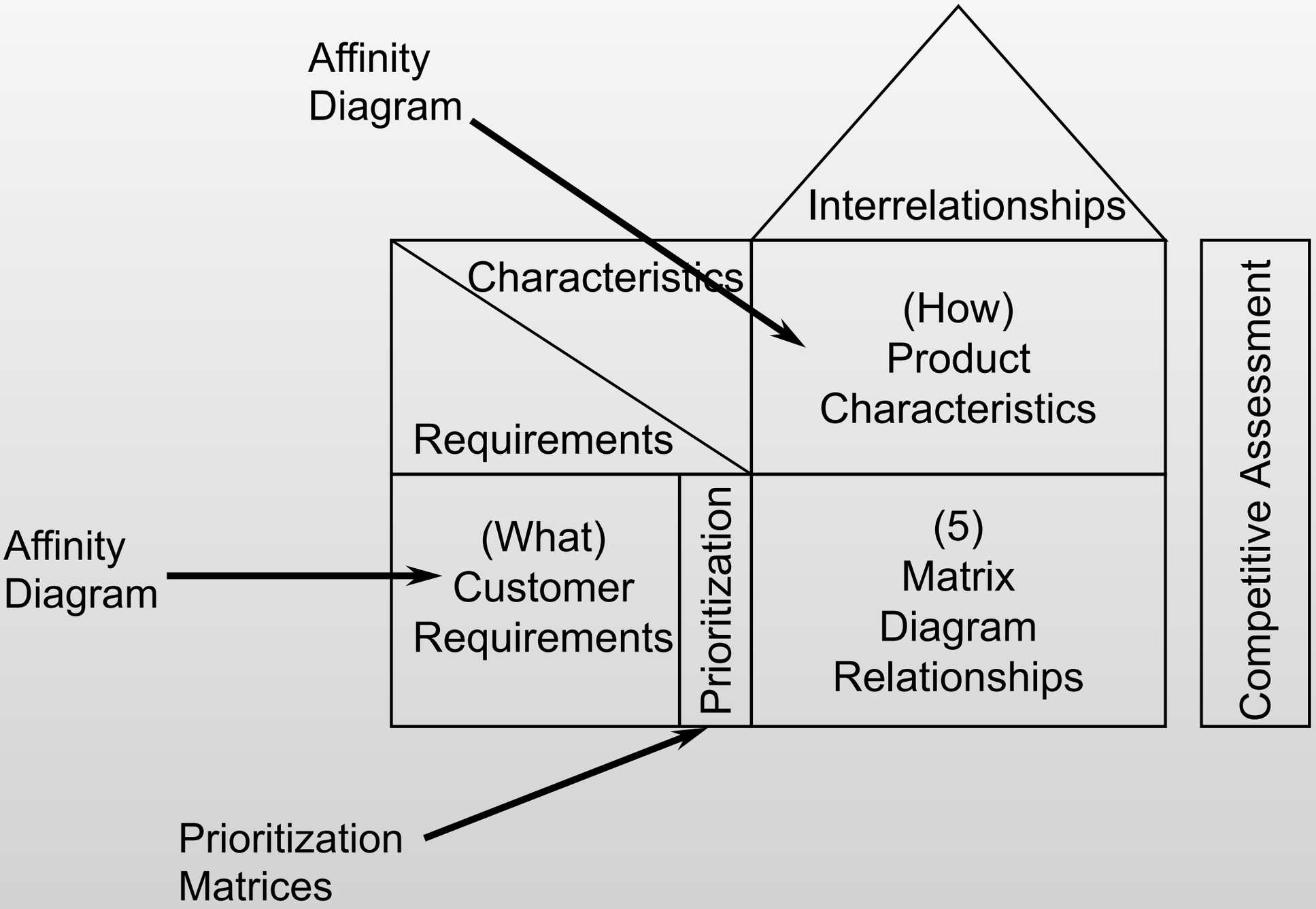
Relationship of MP Tools to HoQ



Relationship of MP Tools to HoQ



Relationship of MP Tools to HoQ



Use of M&P Tools for a Design Project

Use of M&P Tools for a Design Project

- Affinity Diagram to Organize Ideas for Each Problem

Use of M&P Tools for a Design Project

- Affinity Diagram to Organize Ideas for Each Problem
- Tree Diagrams to Assign Tasks

Use of M&P Tools for a Design Project

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- Prioritization Matrix to Create Task Timeline

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- Affinity Diagram to Organize Ideas for Each Problem
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- Matrix Diagram to Ensure You are Addressing All Needs

Use of M&P Tools for a Design Project

- Affinity Diagram to Organize Ideas for Each Problem
- Tree Diagrams to Assign Tasks
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- …

Summary

- Management and planning tools allow you to:
  - Plan more formally
  - Organize information
  - Deal with qualitative information
  - Show relations between items and issues

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  - Plan more formally
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Use Them!!!