Syracuse University

MFE634 Presentation 2

Prevention and Mitigation of Bush Fire in Australia

Group 1

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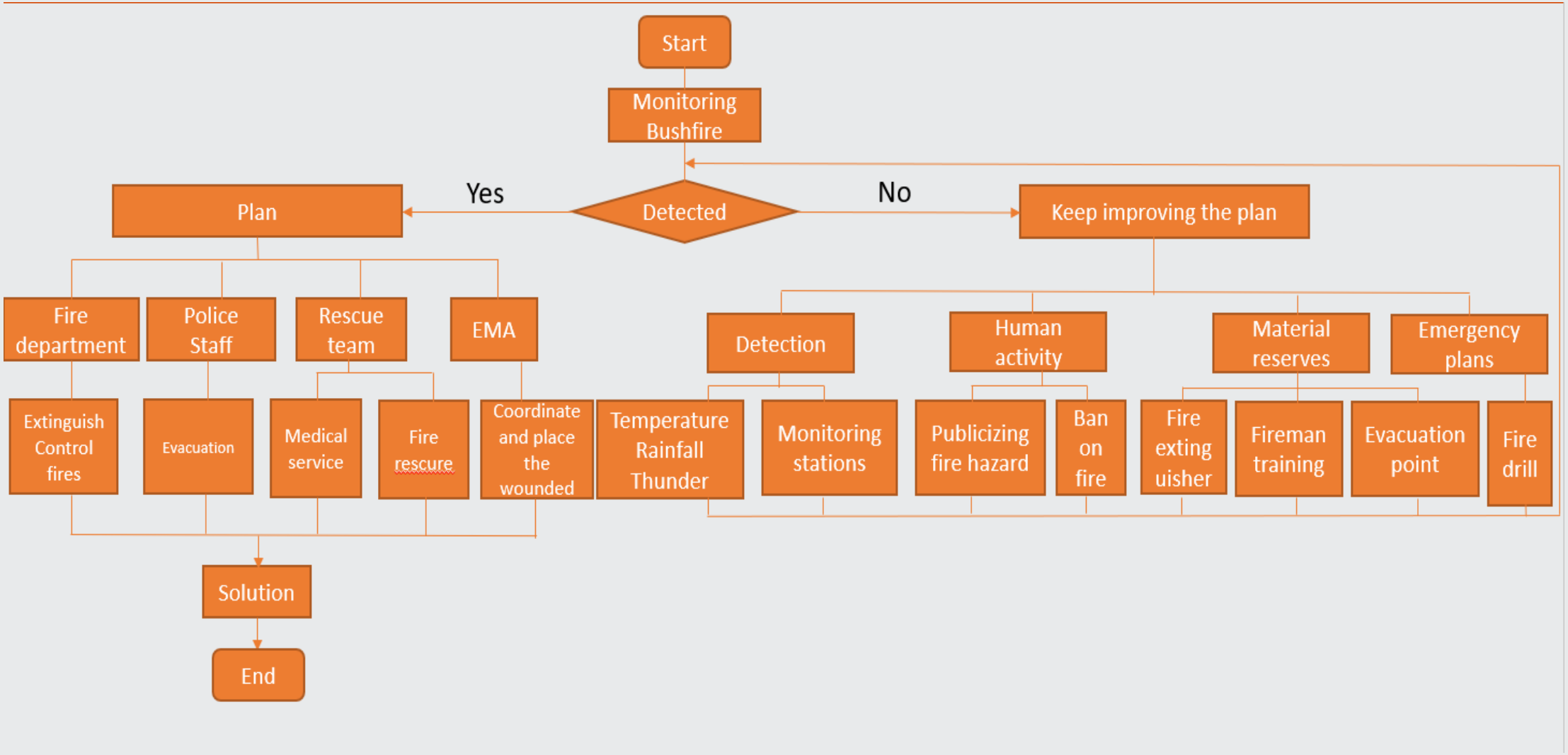
Topics to Cover

- Problem Statement
- Process Flow Chart
- Internal & External Failure
- List of Individual to Interview
- Interview Question & Answer
- Six Sigma
- Cost of Poor Quality (COPQ)
- Affinity Diagram
- Fishbone Chart

Problem Statement

Recent bushfire occurring in Australia is claimed to be the worst wildfire in decades. Several uncontrolled fires began in June 2019, developed to hundreds of fires still burning today. As of Jan.14 2020, Over 34 people were killed, 5900 houses are destroyed, some endangered species may be driven to extinction, billions of dollars are wasted.

Flow Chart


Start
Monitoring Bushfire
Detected
Yes
No
Plan
Keep improving the plan
Fire department
Police Staff
Rescue team
EMA
Extinguish Control fires
Evacuation
Medical service
Fire rescure
Coordinate and place the wounded
Solution
End
Detection
Human activity
Material reserves
Emergency plans
Temperature Rainfall Thunder
Monitoring stations
Publicizing fire hazard
Ban on fire
Fire exting uisher
Fireman training
Evacuation point
Fire drill

Internal & External Failure

Internal Failure	External Failure
Failure of alert system	Drought because low precipitation
Lack of evacuation plan	Dense forest and plantation
Slow reaction of first response team	Traffic jam & bad road condition
No prevention actions	Wind accelerate spread
Outdated fire department equipment	Lack of fireman

List of Individual to Interview

- Director of fire department
- Families of victims
- Wildlife Conservancy
- Nature conservation concil

Question & Answer

- *Director of fire department:*

What preparations did you do before the fire broke out?
We have multiple solutions to deal with wildfires, like equipment and manpower. But this year's wildfire is much larger than expected

- *Families of victims:*

Do you think you have any serious property damage?

Our house, car, and property in the house are basically burnt out. Although we have insurance, we still have a lot of losses.

- *Wildlife Conservancy:*

How is this year different than previous wildfires？

For our part, the number of wild animal disasters has increased and we need more veterinarians to treat injured wild animals.

- *Nature conservation concil:*

How much has the fire affected the local natural environment?

Although mountain fires occur almost every year, this year's scale is so large that people, wildlife and vegetation have suffered losses, and the balance has been broken in a short time.

Six Sigma


1. Define
Define the process and the problem
2. Measure
Measure the current performance
3. Analyse
Analyse the process for issues and root causes
4. Improve
Determine and implement improvement actions
5. Control
Maintain the improved process

Six Sigma

Design

- The high temperature& thunder
- Lack of resource
- Too late to rescue (government)
- Information is blocked
- Many flammable wastes

Six Sigma

Measure

- Verify the project need
- Documenrt the process
- Plan for data collection
- Measure the Process Capability

Six Sigma

Analyze

- Data collection(Temperature from August to September)

- Hypothesis test

Six Sigma

Analyze

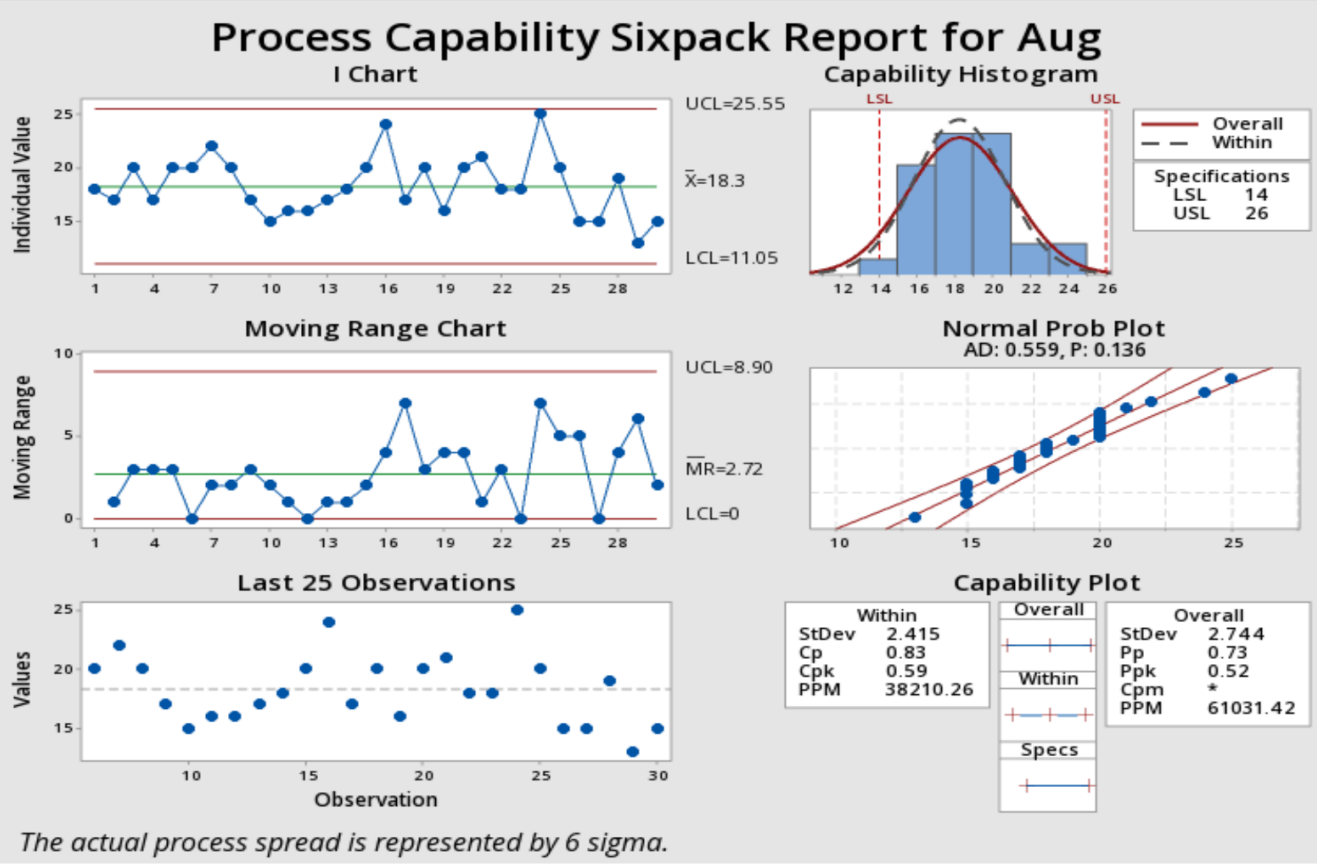
Temperature in Aug 2019 (Before)		
18	16	21
17	16	18
20	17	18
17	18	25
20	20	20
20	24	15
22	17	15
20	20	19
17	16	13
15	20	15

Temperature in Sep 2019 (After)		
22	20	23
19	26	22
22	19	21
27	18	20
21	27	20
28	27	21
18	15	26
19	17	18
17	20	21
16	21	17

Six Sigma

Analyze

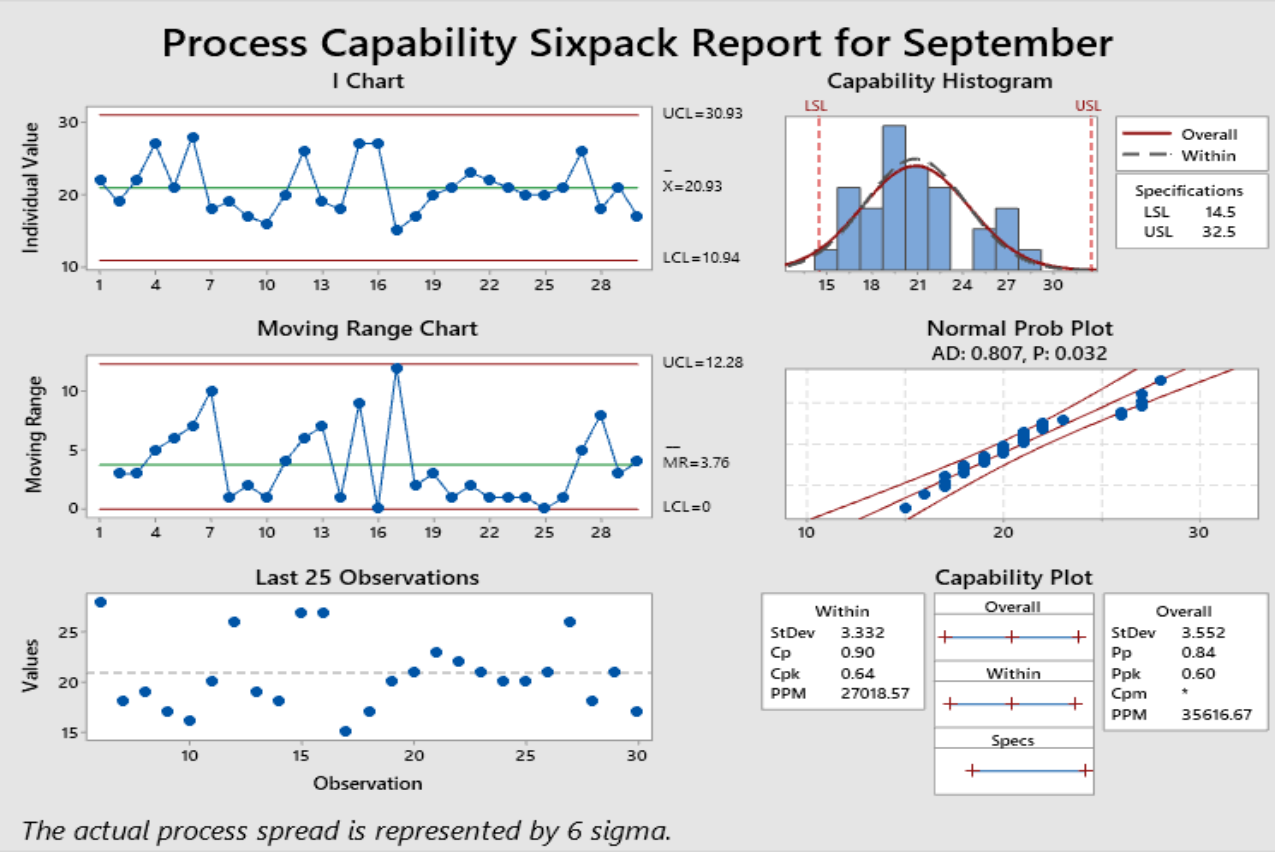
Descriptive Statistics: Before



Six Sigma

Analyze

Descriptive Statistics: After



Six Sigma

Improve

- Improvement Strategy
- Process Failure Mode and Effect analysis (FMEA)
- Design of Experiments (DOE)
- List of remedies selected

Six Sigma

Control (use 5S method)

- Sort: Identify the reason and region of bushfire
- Set in order: Flow chart for dealing with emergency bushfire
- Shine: Staff (fireman、policeman) should follow the original plan to deal with bushfire immediately
- Standardize: Make a checklist to see whether all the equipment and staff are working well
- Sustain: Keep everyone in order and save the damage of bushfire

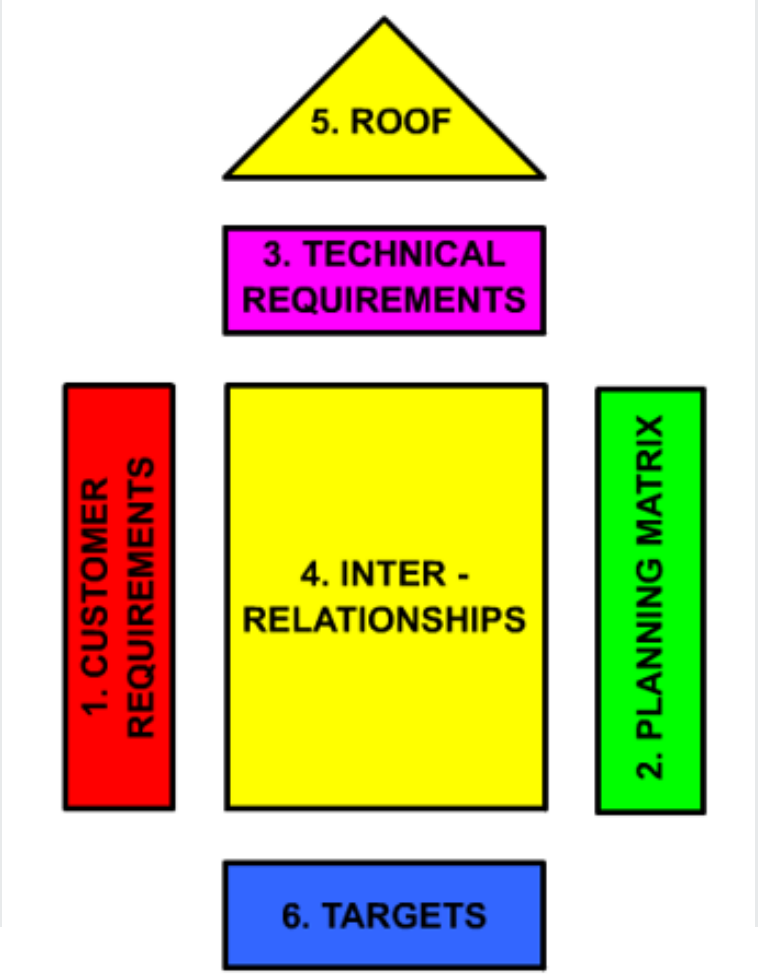
Affinity Diagram

Causes	House	Fire department	Policeman	Medical service
Lighting strike	Flammable materials	Response time	Response time	Response time
Humans	Location	Equipment	Traffic condition	Medicine stock
Climate change	Smoke detection	Regular training	Capability	Medical equipment
Greenhouse gas emissions	Extingishing equipent	Communication	Logistical support	Medical resources
Arson attack		Administration	Number of people	Transportation
		Real-time feedback	Accessibility	

Quality Function Deployment

To identify and carry the voice of the customer through each stage of product or service development and implementation

- Customer Requirements
- Planning Matrix
- Technical Requirements
- Targets
- Interrelationships
- Roof



Customer Needs (who was impacted by the Bush Fire)

- People
- Buildings and Infrastructure
- Commerce
- Toursim
- Species diversity
- Agriculture

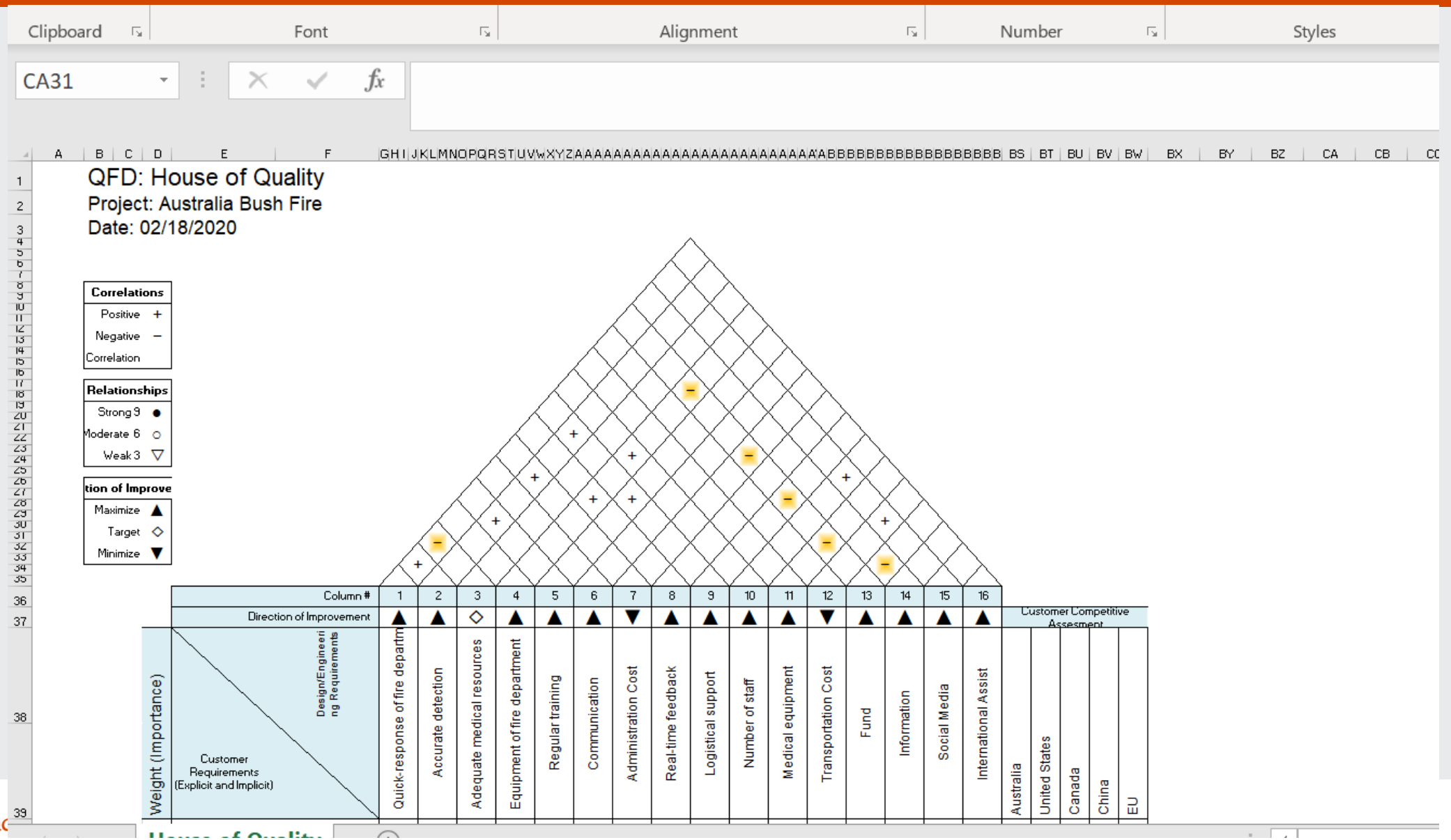
Planning Matrix

- Quantifying the customers' requirement priorities
- Adjusting priorities based on issues concerning the design team

To be improved

- Regular training
- Accurate detection
- Number of firefighters
- Adminstration

HOQ


Clipboard
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CA31
QFD: House of Quality
Project: Australia Bush Fire
Date: 02/18/2020
Correlations
Positive +
Negative –
Correlation
Relationships
Strong 9 ●
Moderate 6 ○
Weak 3 ▽
tion of Improve
Maximize ▲
Target ◇
Minimize ▼
Column #
Direction of Improvement
Customer Competitive Assesment
Weight (Importance)
Design/Engineering Requirements
Customer Requirements (Explicit and Implicit)
Quick-response of fire departm
Accurate detection
Adequate medical resources
Equipment of fire department
Regular training
Communication
Administration Cost
Real-time feedback
Logistical support
Number of staff
Medical equipment
Transportation Cost
Fund
Information
Social Media
International Assist
Australia
United States
Canada
China
EU

HOQ

CA31

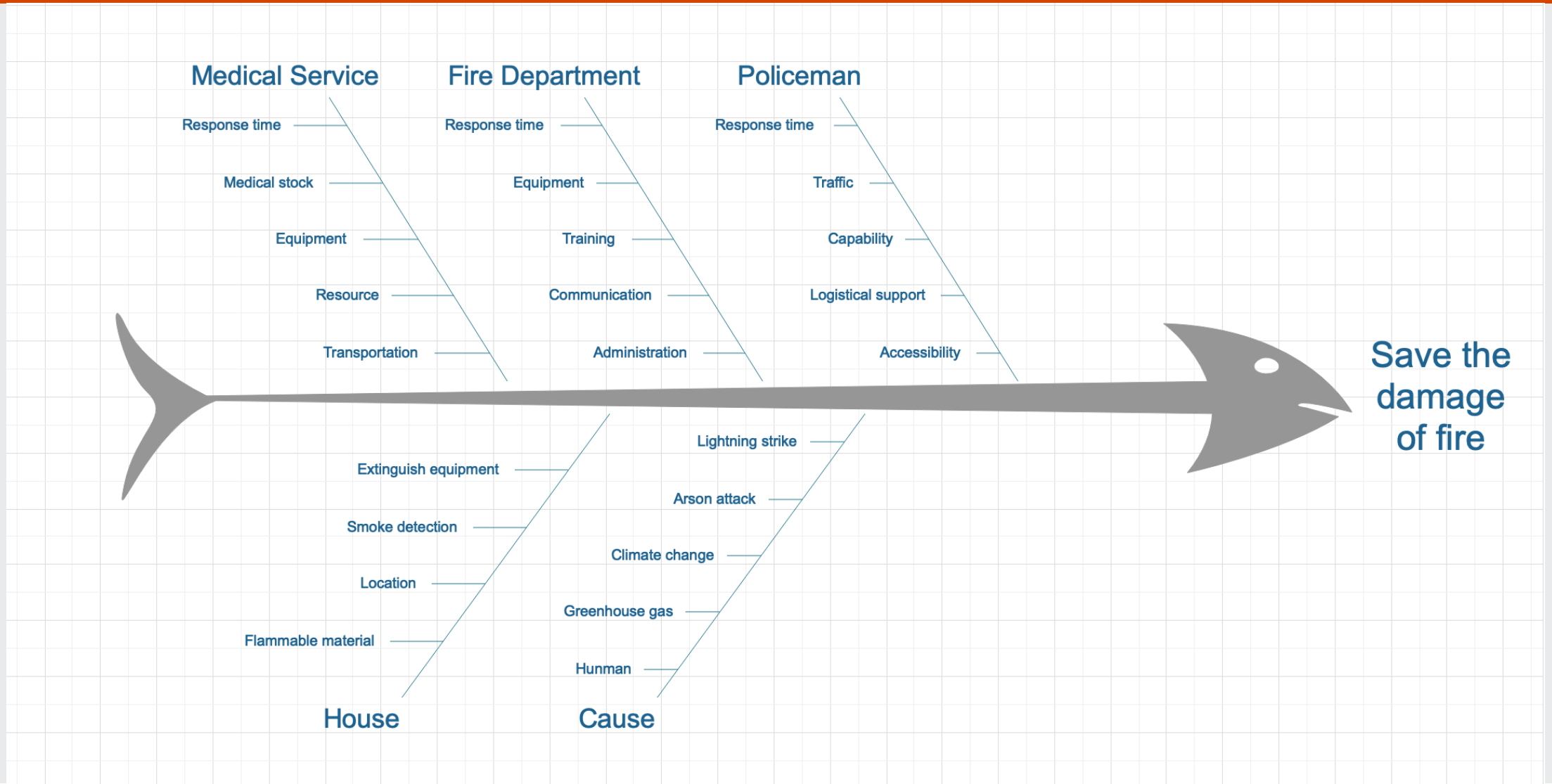
Weight (Importance)	Customer Requirements (Explicit and Implicit) / Design/Engineering Requirements	Quick-response of fire department	Accurate detection	Adequate medical resources	Equipment of fire department	Regular training	Communication	Administration Cost	Real-time feedback	Logistical support	Number of staff	Medical equipment	Transportation Cost	Fund	Information	Social Media	International Assist	Australia	United States	Canada	China	EU
	Column #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Customer Competitive Assesment				
	Direction of Improvement	▲	▲	◇	▲	▲	▲	▼	▲	▲	▲	▲	▼	▲	▲	▲	▲					
8	Personal Safety	●		○		●	●	●	○			●						3	3	4	1	5
2	Buildings and Infrastructure	●				●				○				●				5	4	2	2	4
4	Commerce			○					○						○			2	2	4	3	2
2	Toursim		●					●			○							4	4	3	3	4
3	Species diversity				○	●			●					●		○		3	4	4	4	3
3	Agriculture		●			○					○							3	5	3	5	4
5	Education						○						○					2	4	2	2	3
3	Industry		●							●								3	3	2	3	2
	Weight Chart	96	124	68	56	156	124	96	68	54	36	24	18	24	18	18						
	Column #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16					

House of Quality

COPQ

Process	Internal Failure	External Failure	Appraisal	Prevention
Signal of Bushfire	Dense Houses Building materials are mostly flammable	Global Warming Arson Insufficient rainfall		Building houses with non-flammable materials Reduced house density Prepare for extreme weather
Government	lack of labor lack of equipment	Insufficient funds		Ask for help, funding and equipment from surrounding countries
Post-disaster relief (animals)	Many animals live in the forest and have not been treated professionally after the fire			Establish animal rescue stations in response to fire

Fishbone Chart



Thank you!