Maintenance Management

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Maintenance

Definition:

All necessary actions to preserve the original condition of machinery, equipment, tools, etc.

Why Maintenance ?

Maintenance has become important due to the following factors:

- **Increasing degree of automation & mechanisation.**
- **Increasing competition**
- **Increasing value of production equipment**
- **Increased requirements to profitability and benefit**
- **Increased dependency (e.g. electric power)**
- **May prevent, accidents, breakdowns, pollution, etc.**

=> Estimates savings in Norway with improved maintenance is about 20 billion NOK

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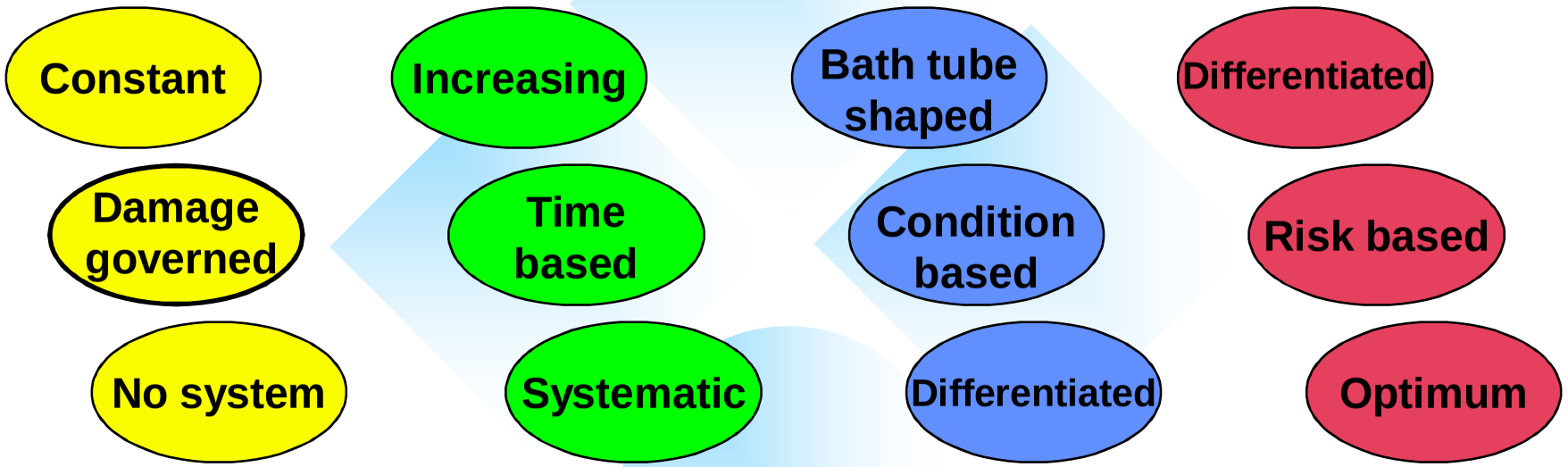
Maintenance History



1950
Focus on Costs
- Systems,
- damage and
- reliability

1970

1990
Focus on Profits
- System,
- functions and
- accessibility

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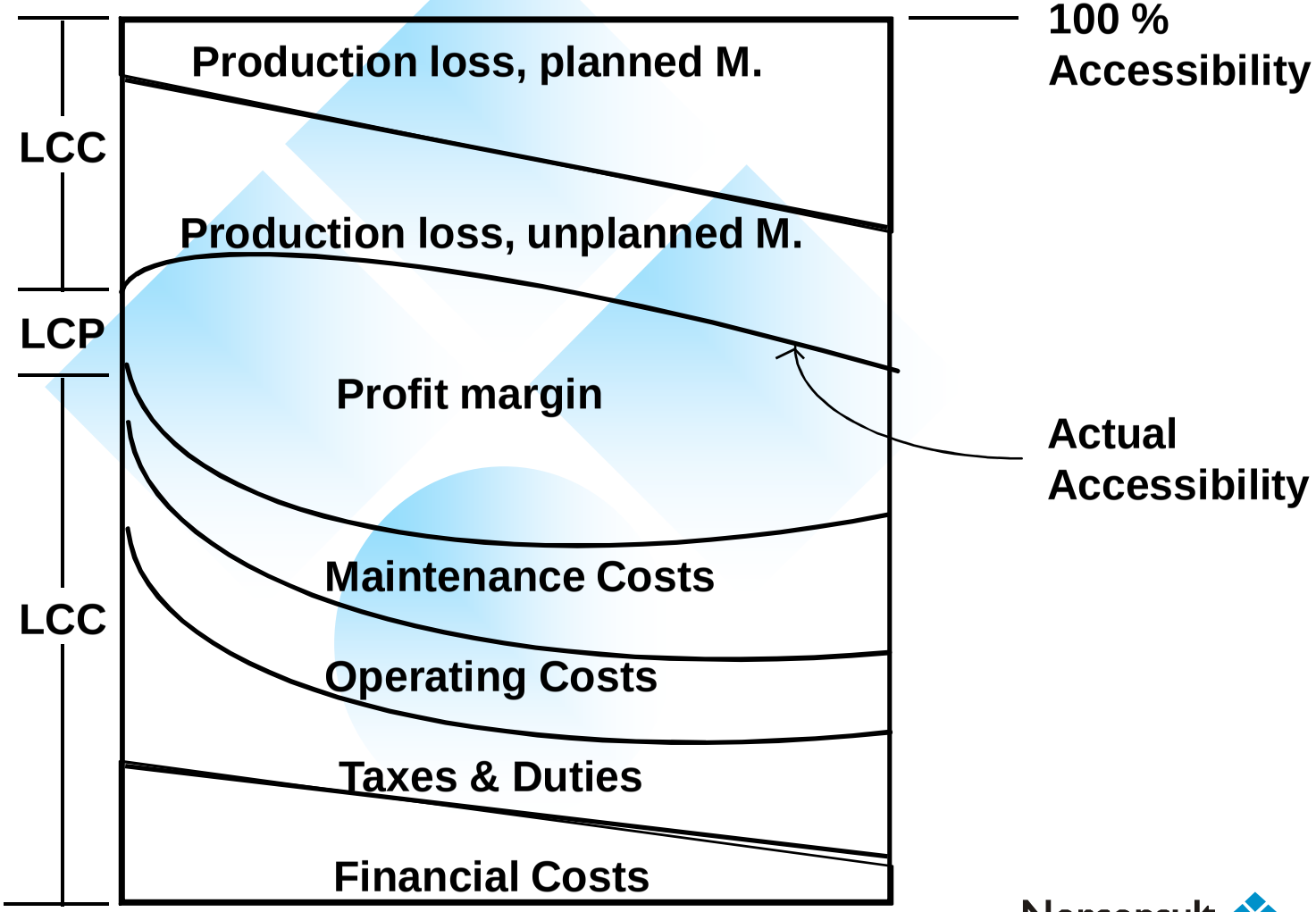
Life Cycle Cost (LCC)



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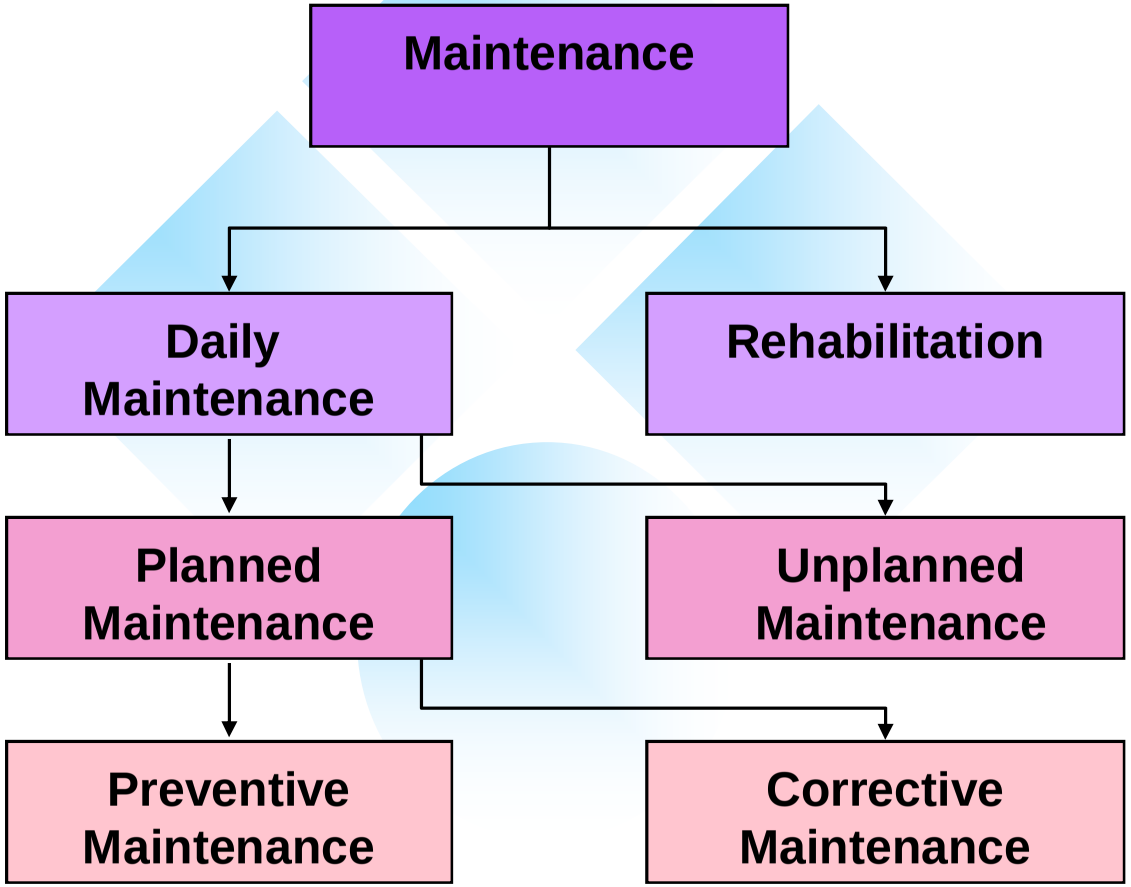
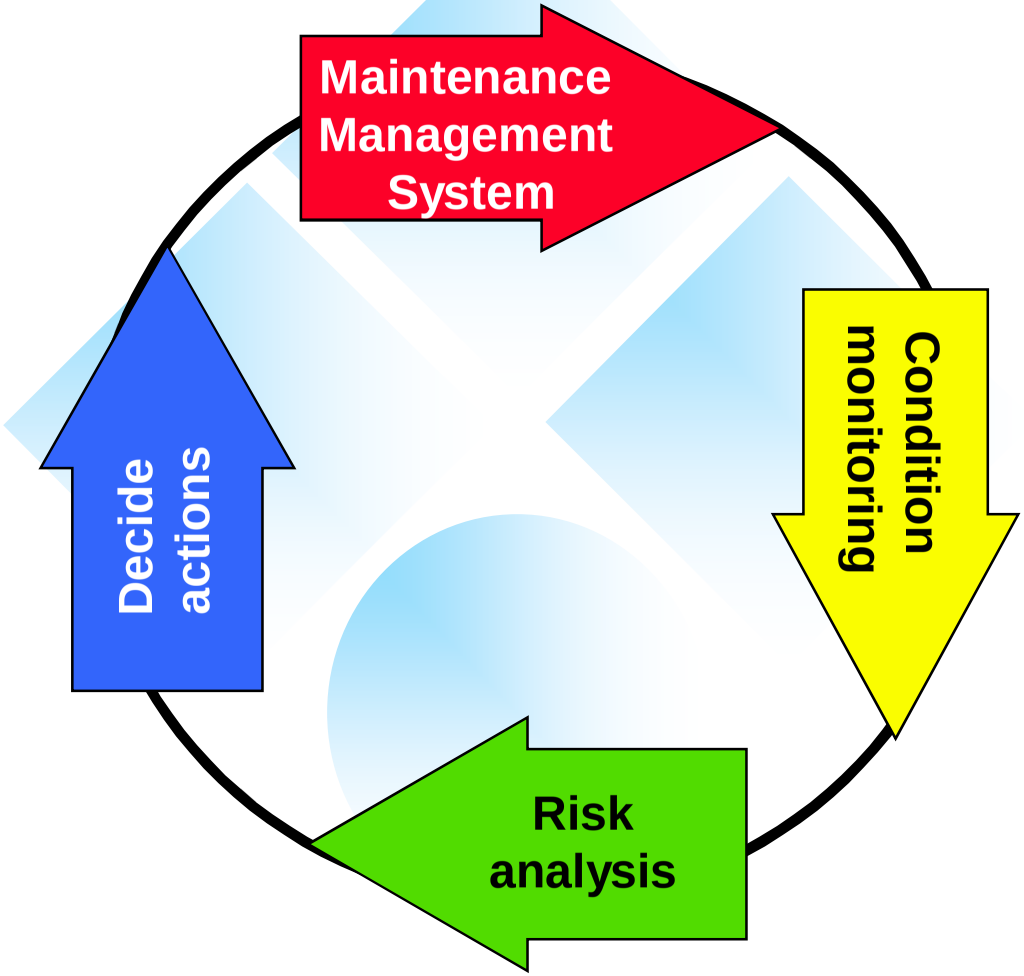
Maintenance Stages



The Maintenance Loop



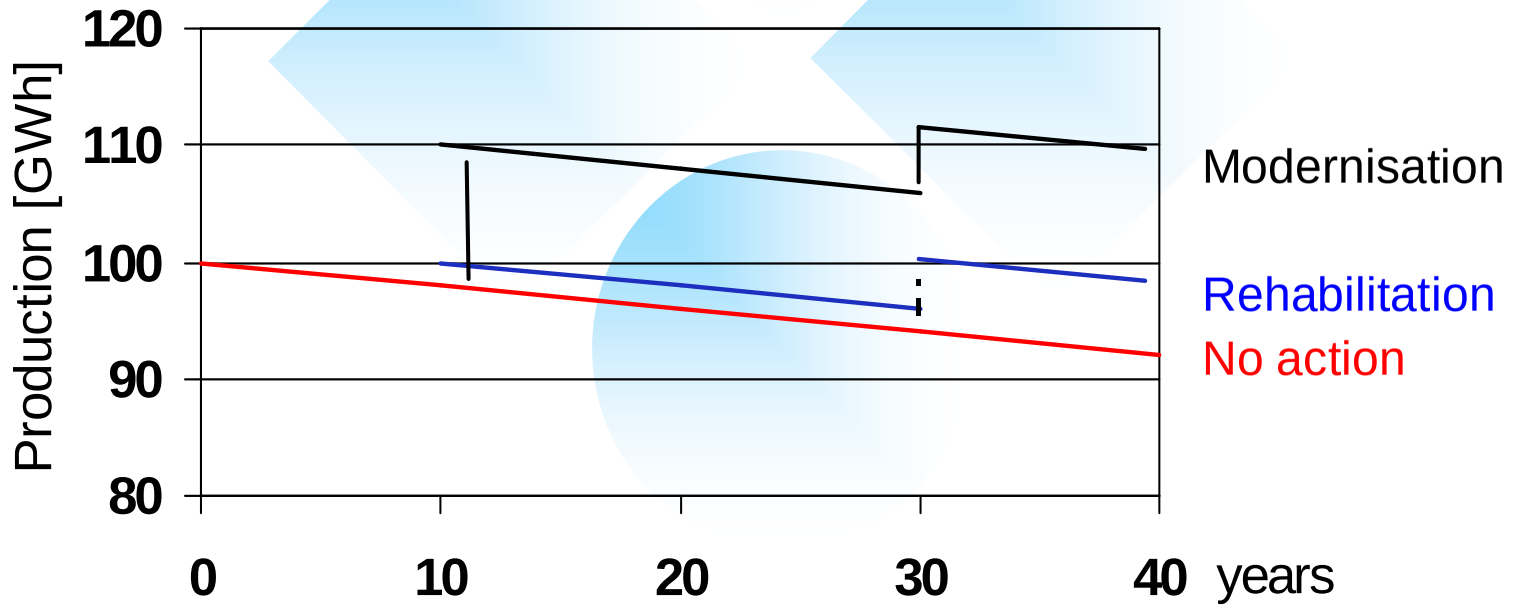
Maintenance Management

Modernisation of hydro power plants. Definitions

Rehabilitation: Bringing back to its original standard and functionality.

Modernisation: Introducing modern technology to improve performance.

Risk (R): The product of Probability (P) and Consequence (C). R=P*C



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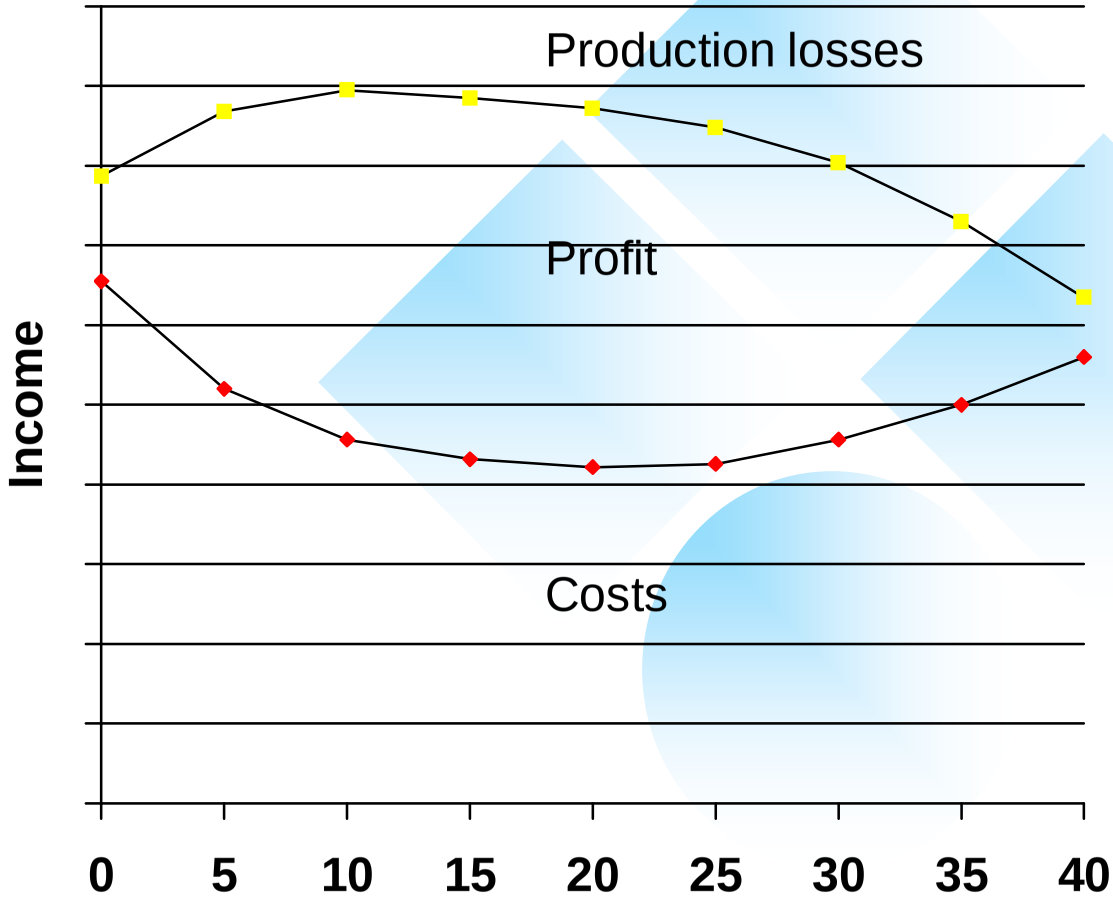
Maintenance planning

Profit is increased by reducing production losses or reducing costs



Production losses from:

- Planned outages
- Unplanned outages

Costs:

- Maintenance
- Operation
- Taxes
- Investment

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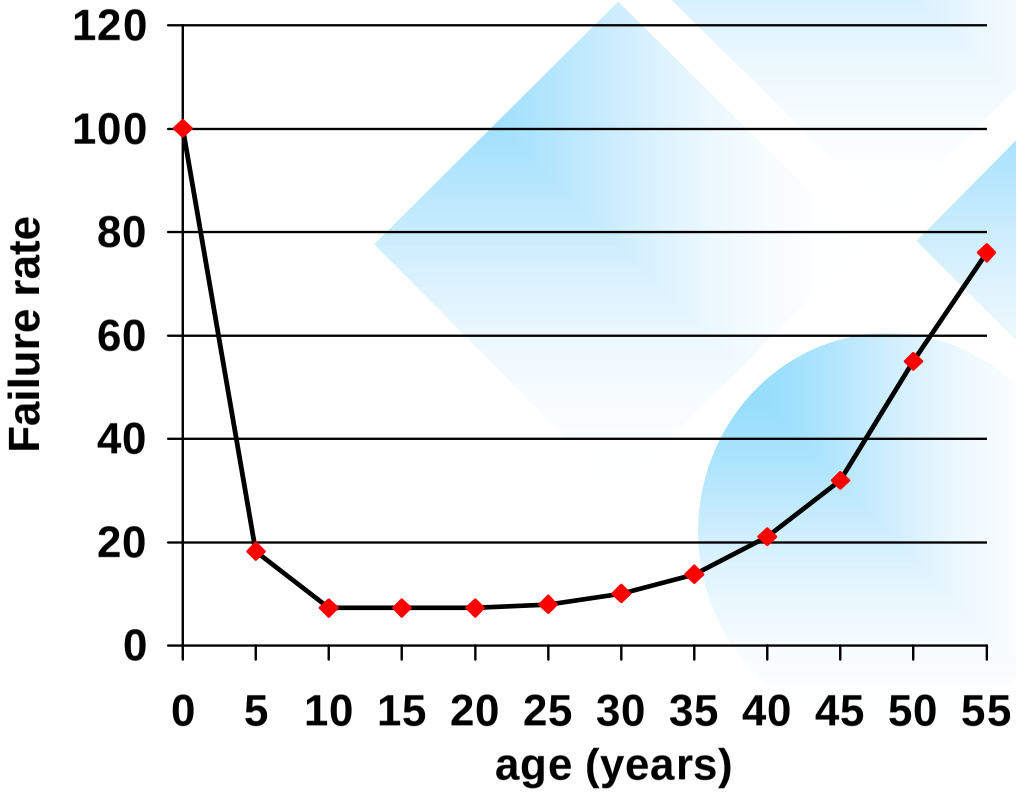
Failure Rate by Years

(Bath Tub Curve)



The failure rate depends on age.

The probability of failure is uncertain.

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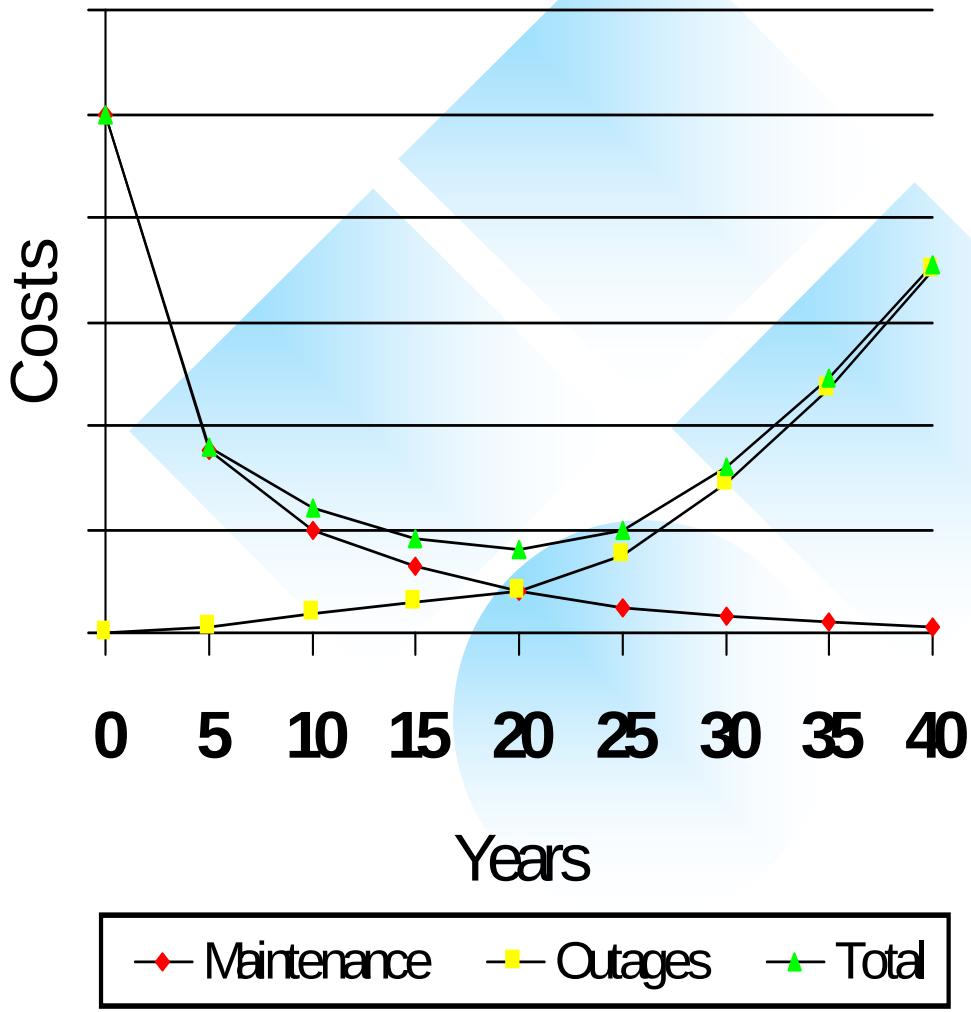
Development of Maintenance Cost



Optimum rehabilitation intervals are influenced by outage probabilities and maintenance cost

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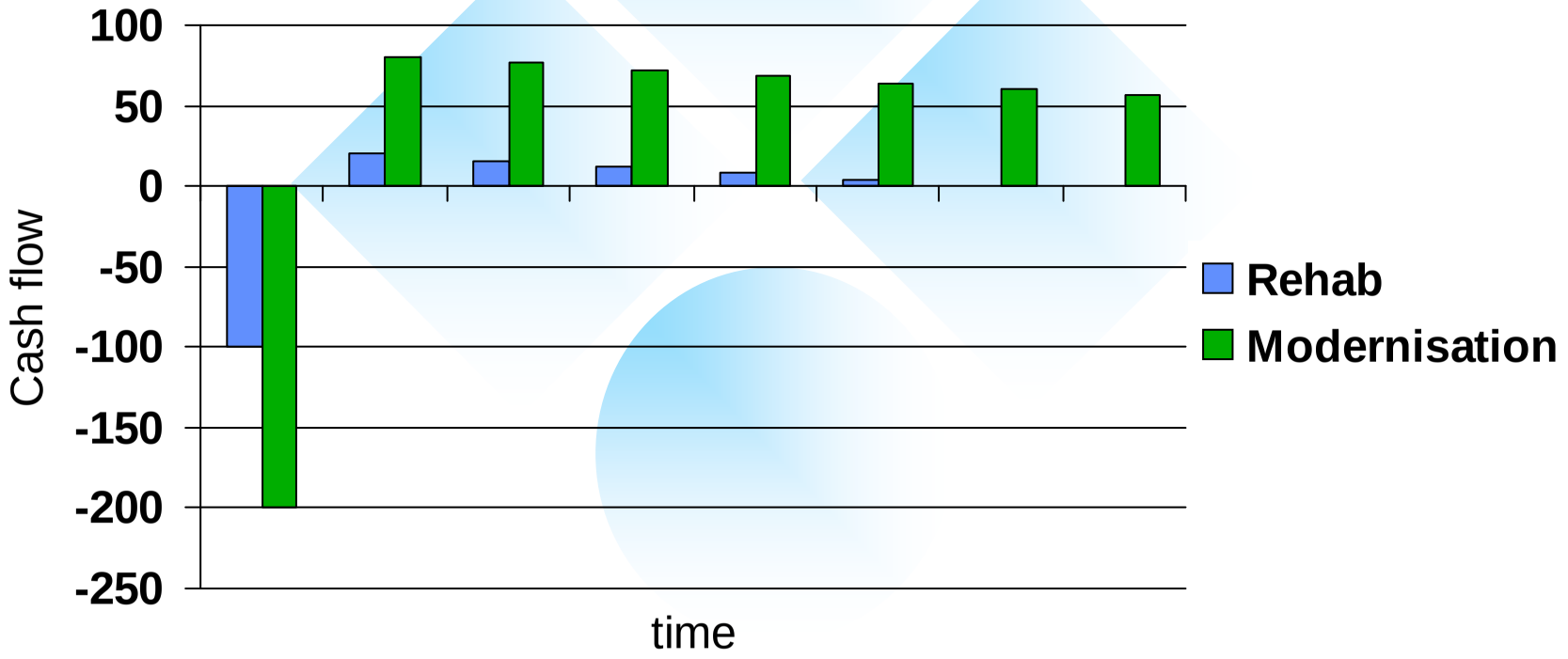
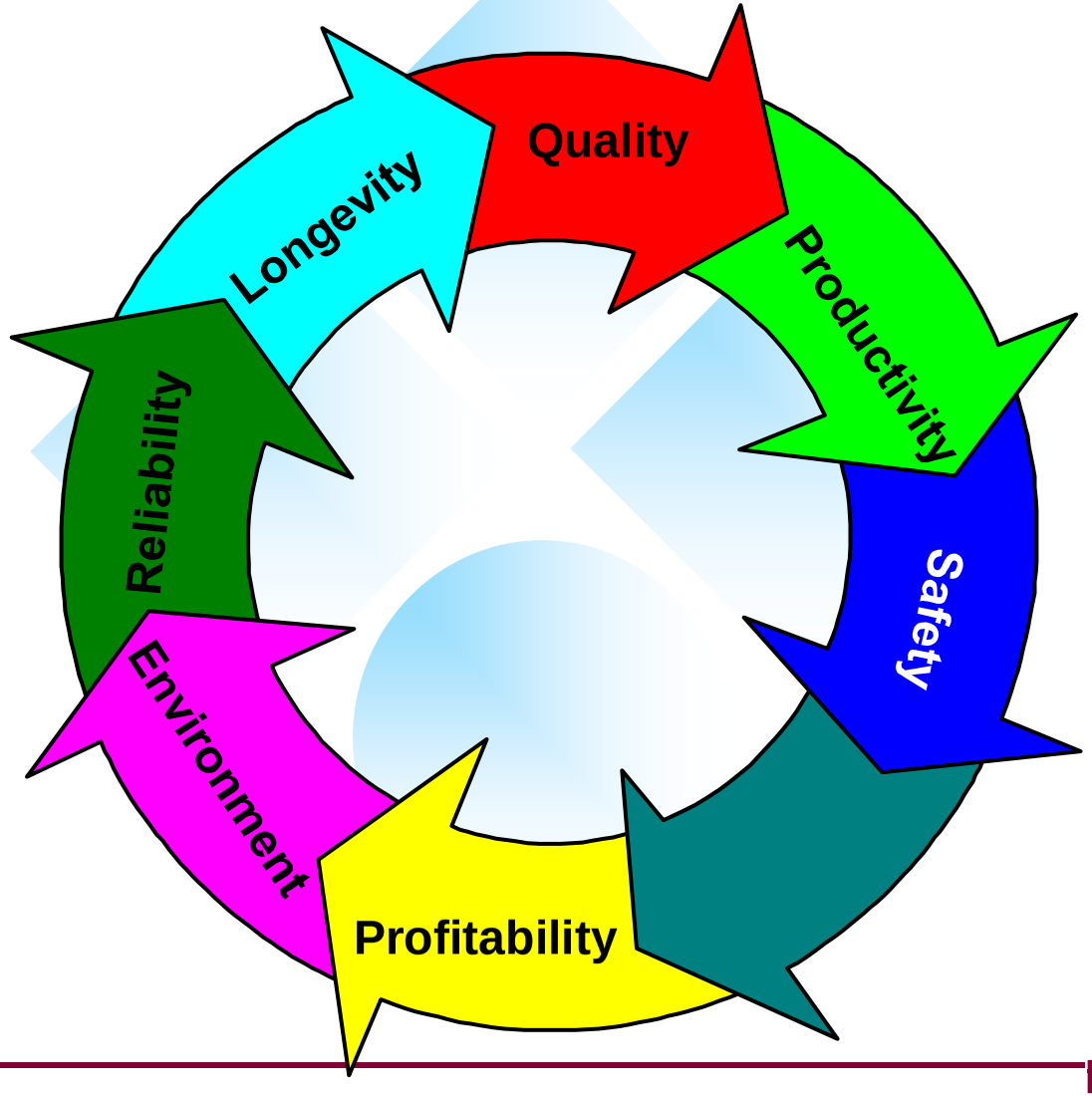
Cash flow during Modernisation and Rehabilitation



Profits by Proper Maintenance



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Risk Analysis

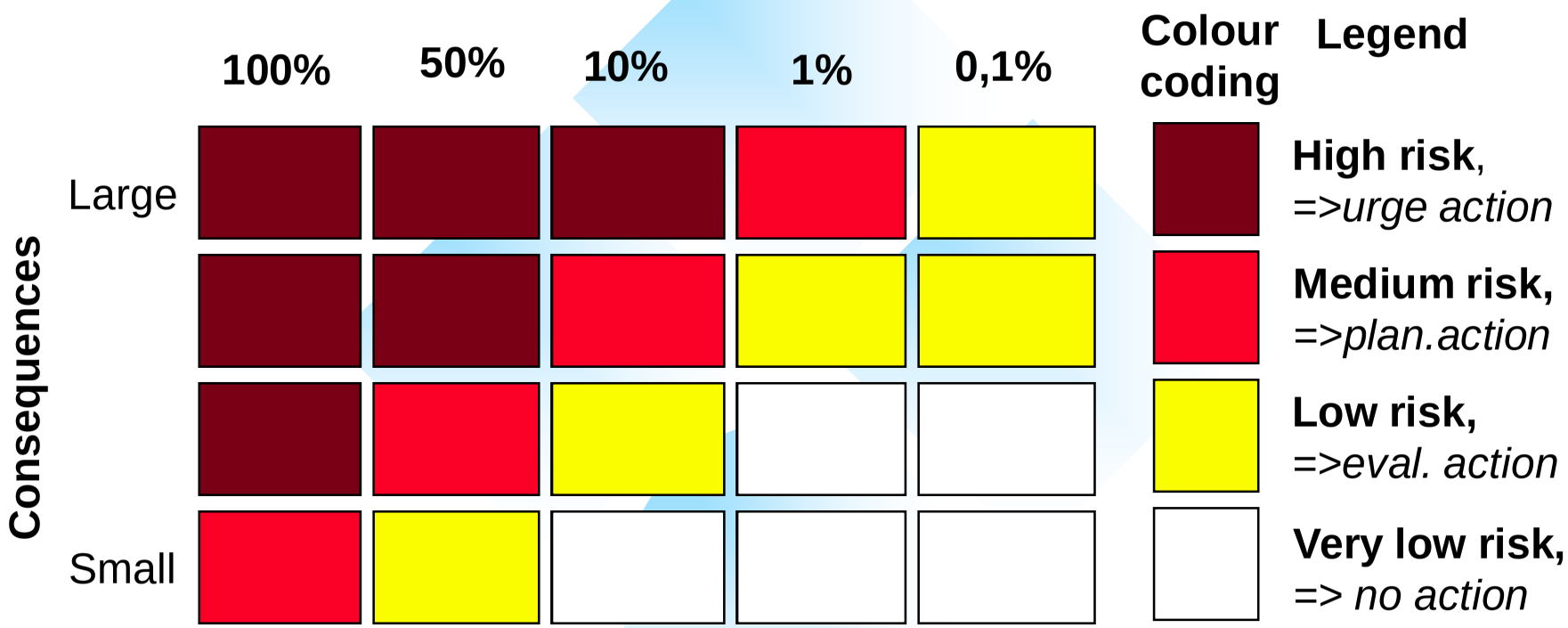
What are the risks ?

- **The risks are the product of**

  => Probabilities and Consequences (P*C)

  - Probabilities (small - large)
  - Consequences
    - Economic (small - large)
    - Health and Safety (small injury - death)

Risk Matrix



A systematic and objective method for evaluation of cost and benefit.

Each company have to define consequences, categories and limits

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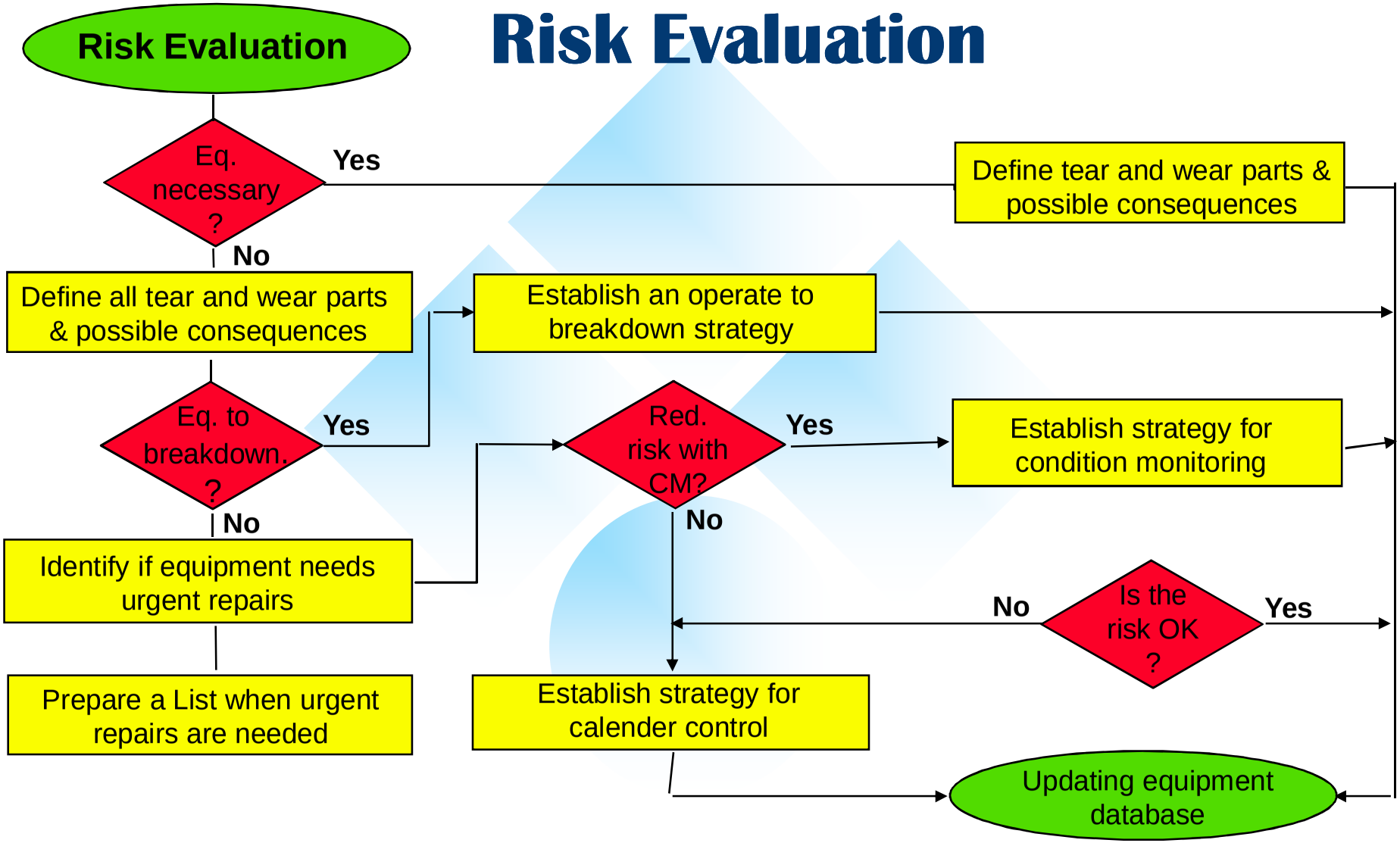
Risk Evaluation



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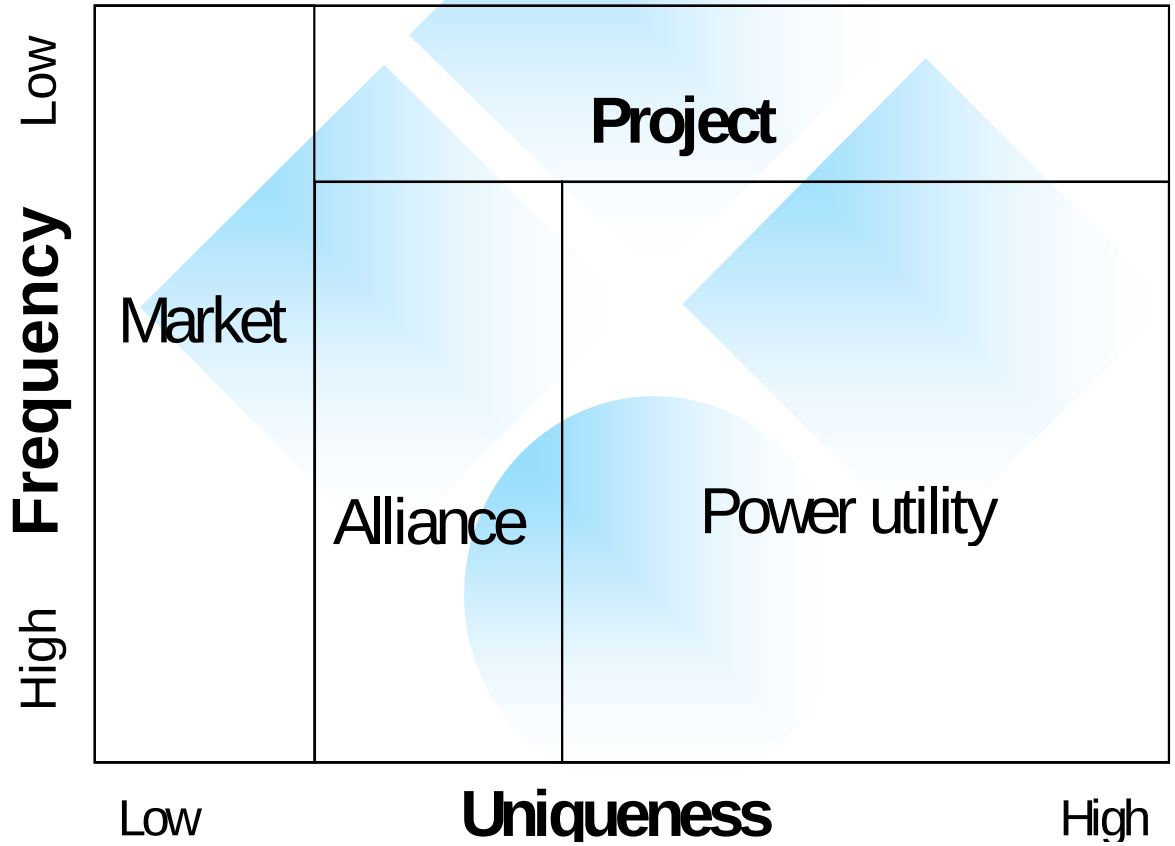
Organisation of Maintenance



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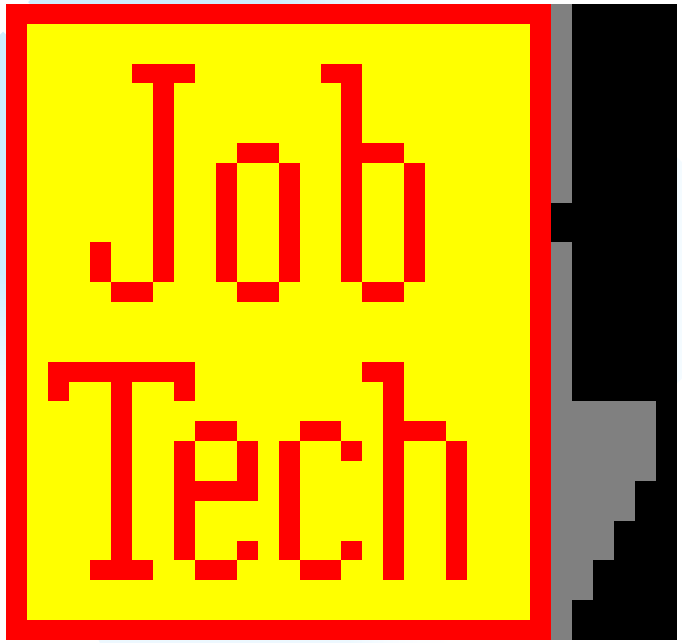
JobTech
Maintenance Management System



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