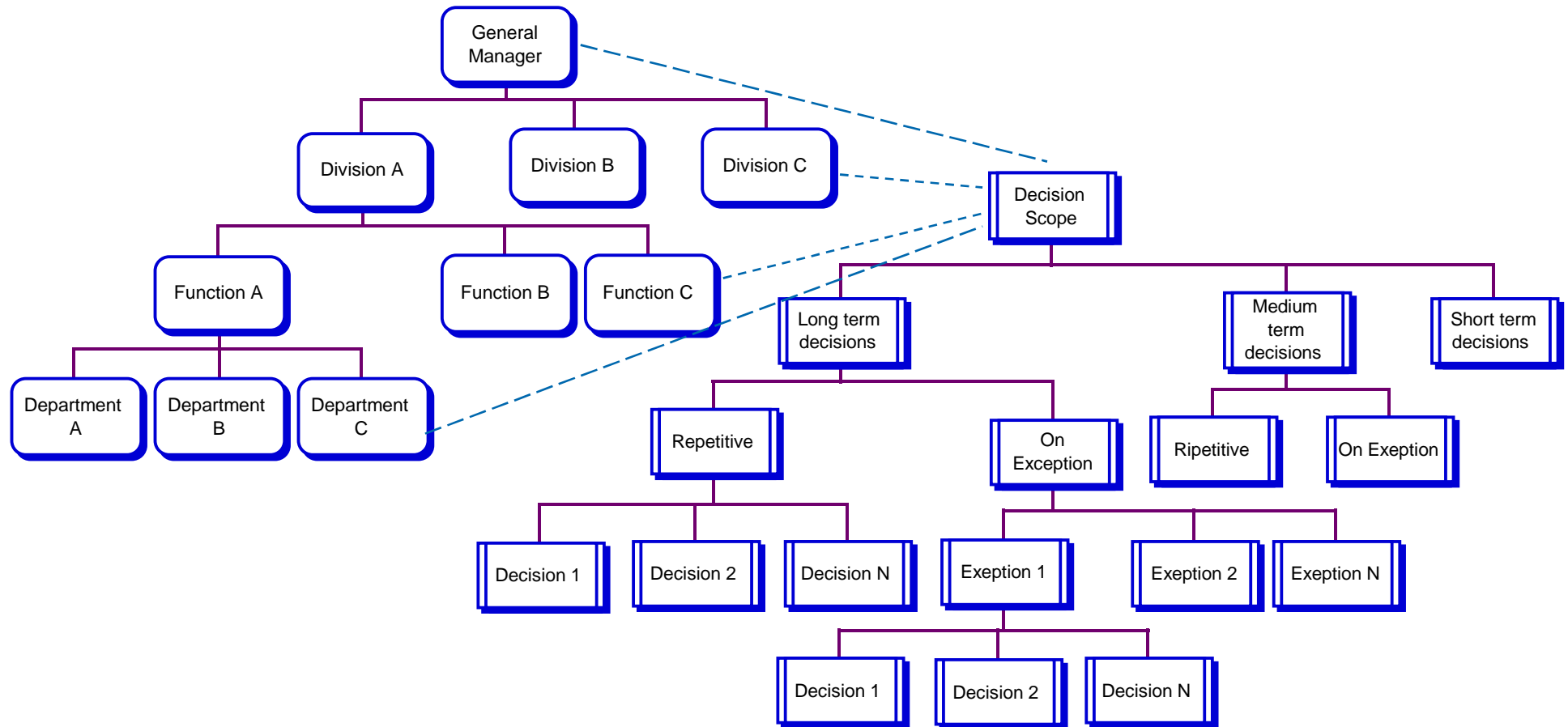


# Introduction to decision modeling

By Filippo Vasta

# The *decision* perspective of the organization



# The case for Decision Modeling

- ❑ **Every Organization is a “Decision Machine”**
- ❑ **Competitiveness is the result of good decisions**
- ❑ **The modern, succesful organization must me equipped with the best decision “toolbox”**





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# The decision “toolbox”

- ❑ **Clear definition of decision responsibilities**
  - Structure decision scope
    - Long term, Medium Term, Short Term, On Exeption, who decides on what
- ❑ **Decision culture**
  - How to structure and model decisions
  - How to use decision modeling support tools
    - Goal seeking
    - Montecarlo simulation
    - DOE (Design of experiment)
  - How to effectively get the right info from existing information systems
    - Data warehousing, Time series, Neural Networks

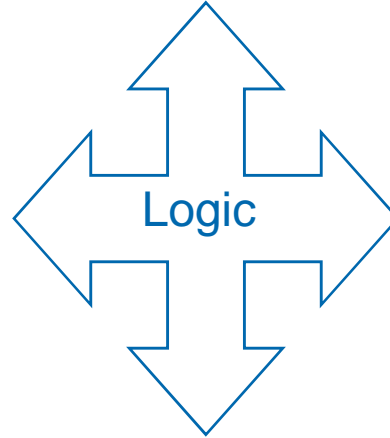
# Decision Anatomy

## Alternatives



Possible values of  
Discretionary  
variables

## Decision



## Decision quality measures



Constraints  
Non discretionary parameters

# Decision criteria

## □ Decision quality measures

- *Directly quantifiable cost/value measures*
- *Operational performance parameters easy to translate into economic & financial measures*
- *Complex benchmarking measures not easy to be translated into economic & financial measures*



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## ***Directly quantifiable cost/value measures***

- Differential cashflow**
- Differential profit**
- Differential earnings**
- Differential savings**
- Differential present net value**
- Differential internal return rate**
- Payback period**
- Return / Risk ratio**
- Expected economic value**
- ...**



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## ***Operational performance parameters easy to translate into economic & financial measures***

- Out of stock quantities**
- Cycle time**
- Waiting queues**
- Lost sales**
- Average delivery delay**
- Inventory levels**
- Average equipment utilization**
- Average effectiveness**
- Change overs**
- % of customer below target service level**
- ....**
- Overtime**
- Material usage**
- Fault rates**
- Specific consumption**
- Consumption variability**
- Man hours requirement**
- Material requirements**
- Fault detection probability**
- Number of repairs**
- Time to repair**
- Outdated inventories**
- ...**

## ***Complex benchmarking measures not easy to be translated into economic & financial measures***

### □ Some examples

- *Degree of strategy coherence*
- *Customer satisfaction index*
- *Average delay weighted according with customer importance / jobs turnover*
- *Weighted completeness index*
- *Service level index*
- *Risk index*
- ...
- ....

# Constrains

- Financial resources
- Production capacity
- Warehouse capacity
- Human resources
- Shelf space
- Customers
- Transportation capacity
- Holidays
- Shift rules
- Trade unions
- Minimum assortments
- ...



# Decision = Optimization

- Selection of best alternative should:
  - Maximize the value of decision quality measures selected for the problem
  - In compliance with all identified constraints
- Therefore a “good decision” must be an optimized decision
  - The best possible decision in relation to the decision quality measures and related constraints

# Decision risk



- ❑ Decisions set future course of actions
- ❑ The future is by definition uncertain
- ❑ Therefore all decisions are based on uncertain assumptions
- ❑ Consequently is important to evaluate the degree of uncertainty implied by a decision

# Decision modeling approach

- ❑ Define decision problem
- ❑ Identify decision scope (alternatives and discretionary parameters)
- ❑ Define decision quality measures
- ❑ Identify all relevant non discretionary parameters
- ❑ Fix scenario average values for non discretionary parameters
- ❑ Fix range of variations for non discretionary parameters
- ❑ Build decision model (*MbyM Expertise*)
- ❑ Look for optimal decision (using goal seeking)
- ❑ Analyse variability and risk (Montecarlo simulations)
- ❑ Add your experience and intuition
- ❑ Take a decision



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# The Decision Toolbox

## □ Competencies

- How to use cost data when facing a decision (management and cost accounting)
- How to evaluate return on investment (return on investment analysis techniques)
- Data analysis techniques and methodologies (eg. Navigator)
- How to build decision models (advanced Ms-Excel model building plus goal-seeking)
- Statistics (probability distribution, confidence intervals, significance tests)

## □ Tools

- Data-warehouse & Query
- Goal seeking ,
- Montecarlo simulation
- Visual simulation
- Neural networks
- Time series analysis
- EVA – Economic value analysis



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# Role of MbyM

## ❑ What do we sell?

- Consulting Expertise to assist the Client in the structuring and modeling of decision problems in a wide range of company processes

## ❑ Who controls the process of model development?

- The Client as he is the Problem Expert

## ❑ How does MbyM assist the client?

- We help the client in defining and structuring the problem by setting the objectives, the constraints and the ranges of the discretionary variables
- Once the decision logic is agreed we proceed to the development and test of the model

# Some potential decision modeling applications

- ❑ Strategic planning optimization
- ❑ Production planning
- ❑ Production scheduling
- ❑ Project scheduling
- ❑ Strategic capacity right-sizing
- ❑ Strategic sourcing from multiple production sites to multiple consumption sites
- ❑ Plant lay-out optimization
- ❑ Logistics network optimization
- ❑ Optimal exponential smoothing parameters calculation
- ❑ Production rates data calculation
- ❑ Pricing scale optimization
- ❑ Trade unit size optimization
- ❑ Assortment optimization
- ❑ Sales plan optimization
- ❑ Commercial spending optimization
- ❑ SKU Warehouse location optimization
- ❑ Office space optimization
- ❑ Product specification optimization
- ❑ ...