

# **PLANNING OF PHARMACEUTICAL FACTORIES CONCEPT AND IMPLEMENTATION**



## **WORLD CLASS PHARMA FACILITY**

### **PRESENT SCENARIO :**

**The globalization and open market policies have proved to be a boon for the industries, but also have generated the need for globally acceptable manufacturing facilities.**

**There are many flourishing manufacturing facilities, but not all are in compliance with the various regulatory standards.**

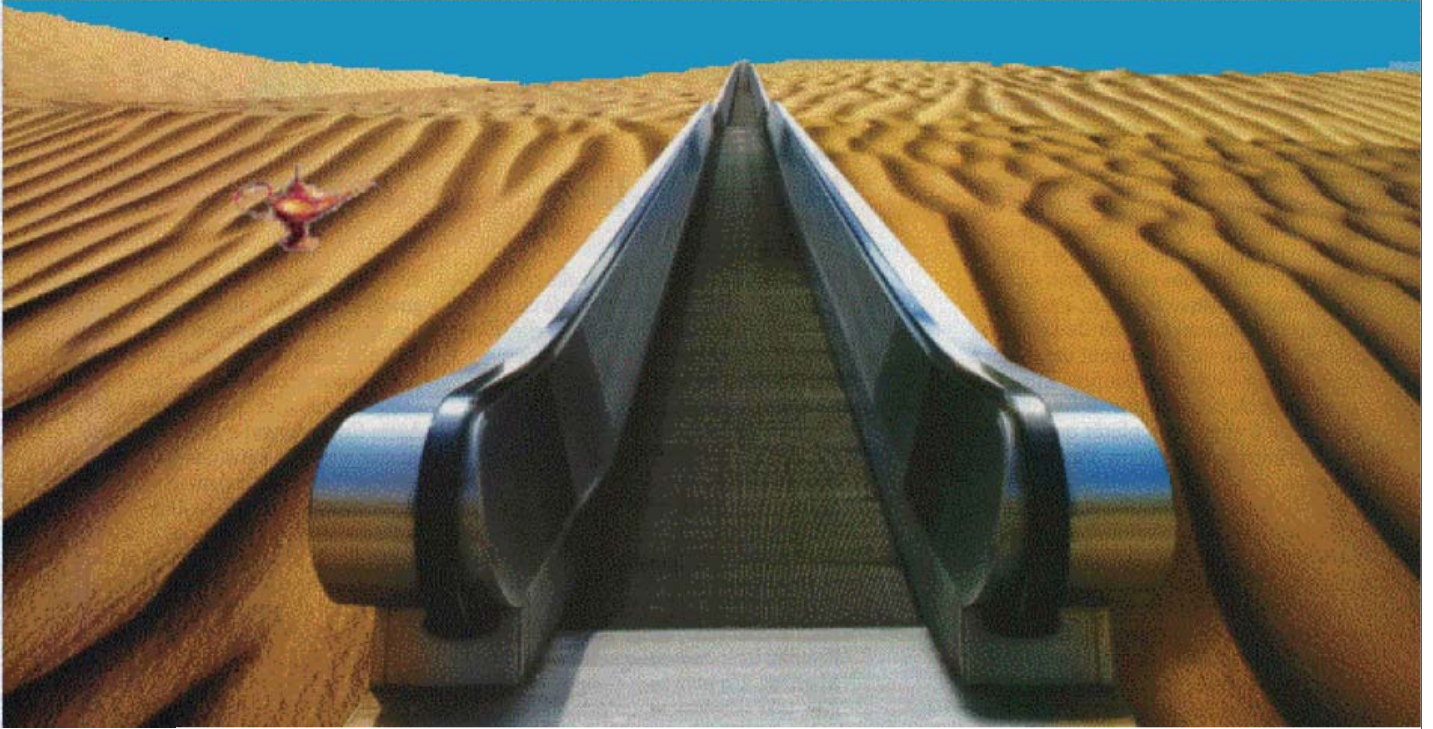
### **NEED FOR A FACILITY :**

**Rapid change in manufacturing technology & various regulatory compliances to upgrade for better solution in line with cGMP.**

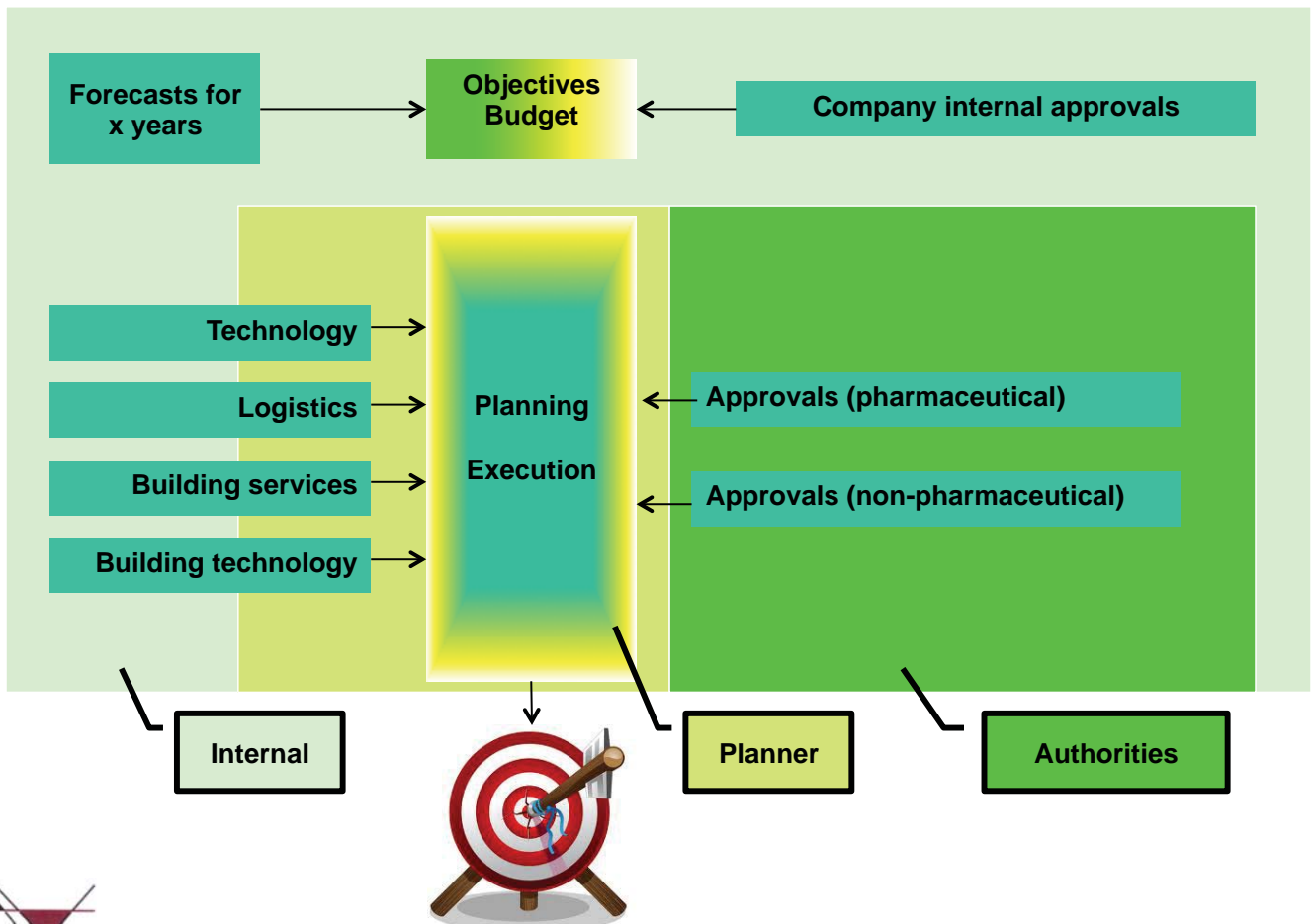
**With globalization, the need for a compliant facility has become a statutory necessity.**



If you have decided to build a new factory .....  
or to revamp an existing one ....  
...be aware that planning is not easy and  
that it is not a smooth way...

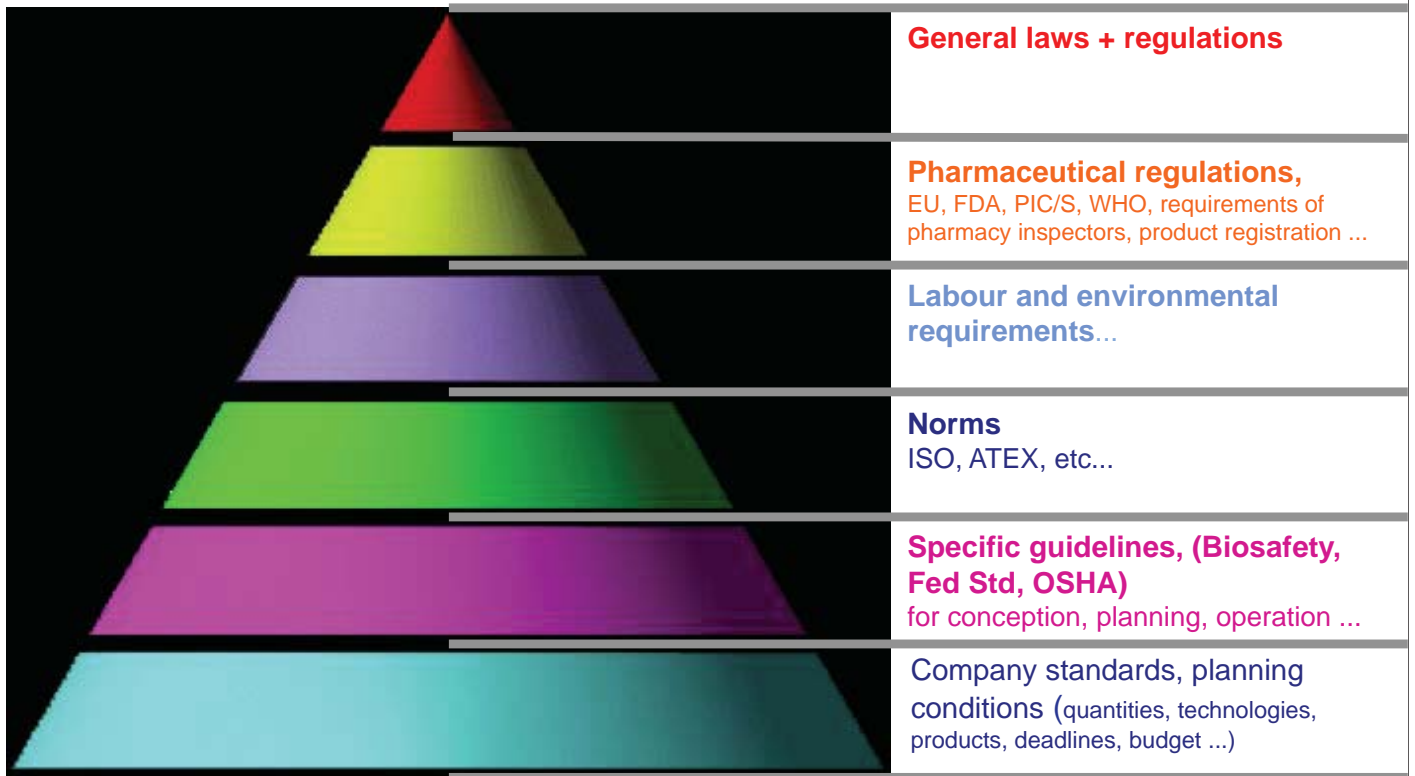


## PARTICIPANTS TO THE PLANNING PROCESS

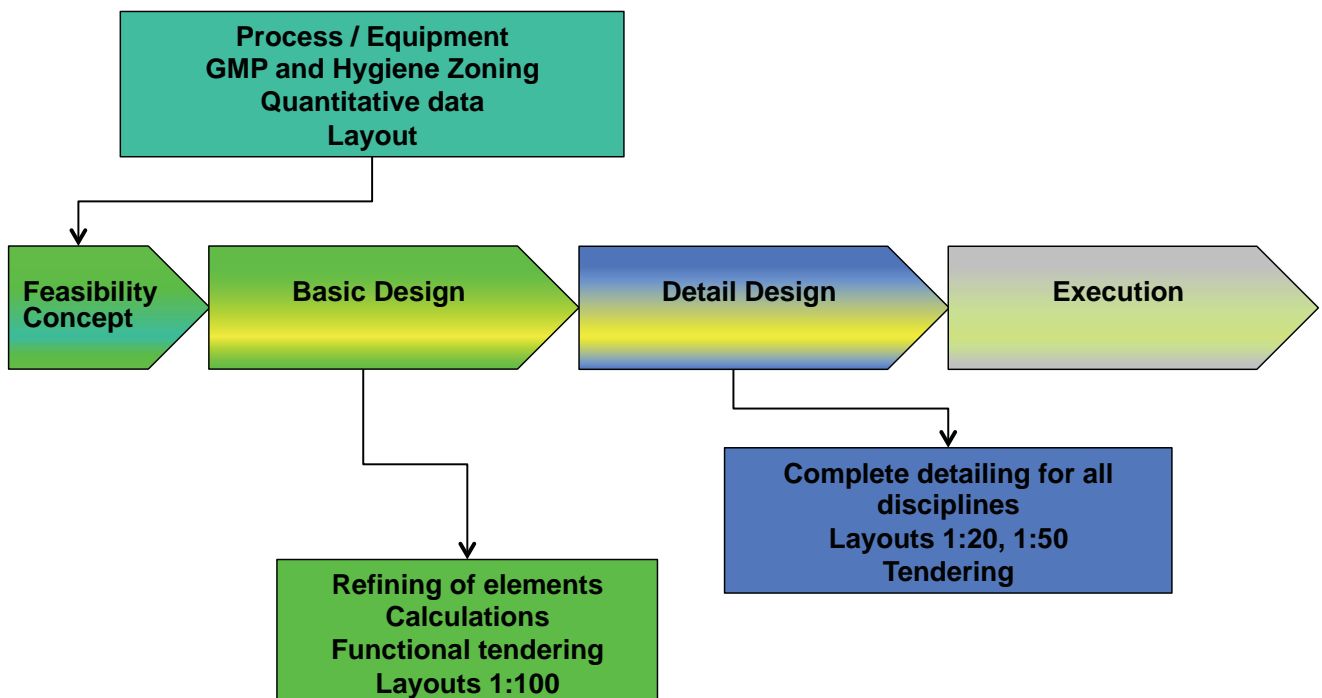




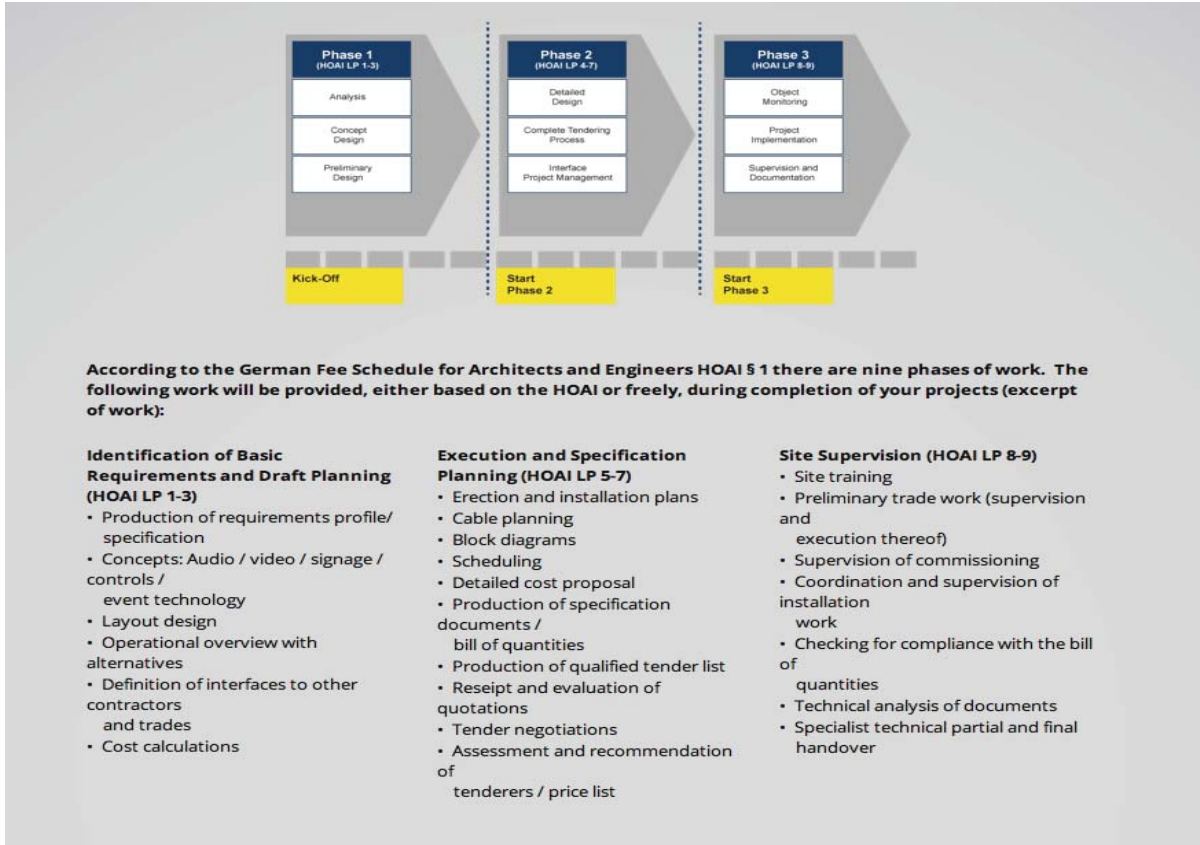
# NORMS, REGULATIONS AND REQUIREMENTS



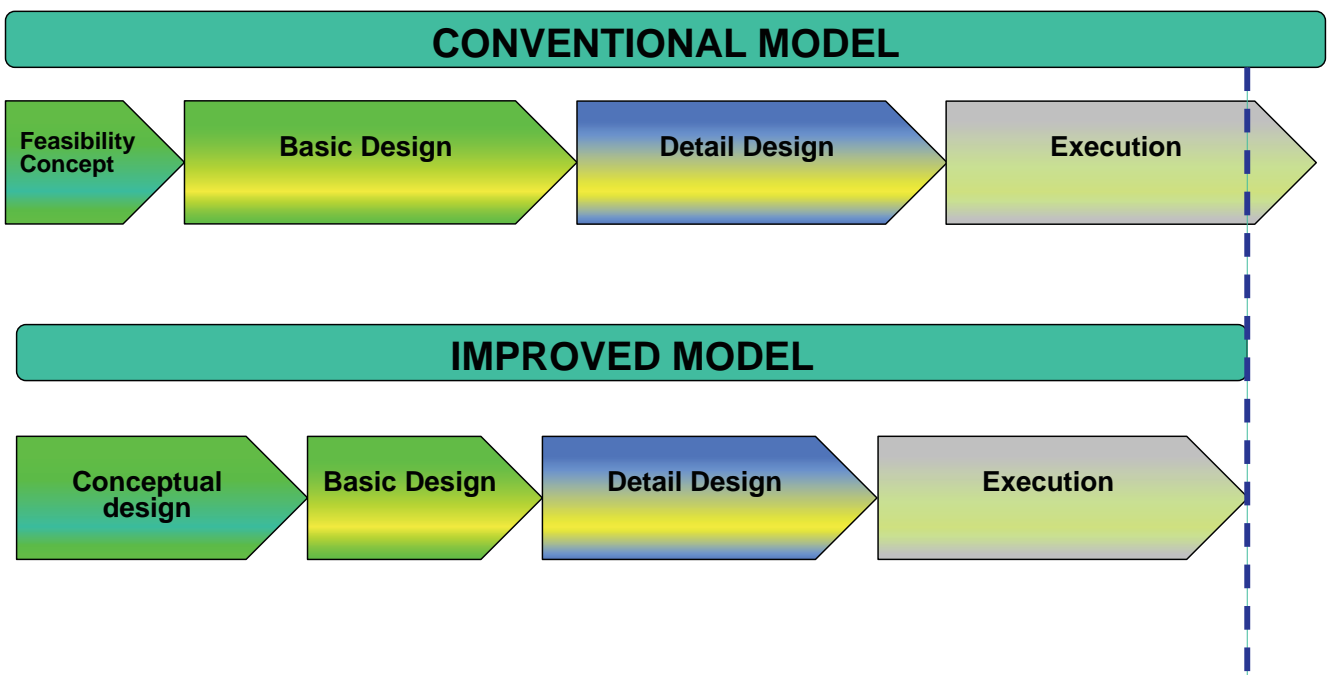
# PLANNING STEPS



# HOAI



# PLANNING MODELS



# FEASIBILITY VERSUS CONCEPTUAL STUDY

## Feasibility

- Static
- Dominated by Economical Criteria
- No Project Alternatives:
- Yes / No only
- No Influence on Schedule of Subsequent Phases

## Conceptual Study

- Includes the Feasibility Study
- Dynamic / prospective
- Dominated by Technical Criteria
- Project Alternatives are generated
- User oriented
- Choices possible
  - Costs
  - Technology
  - Organisation
- Reduces Time spent on subsequent Phases, while increasing their Precision



# PLANNING MODELS

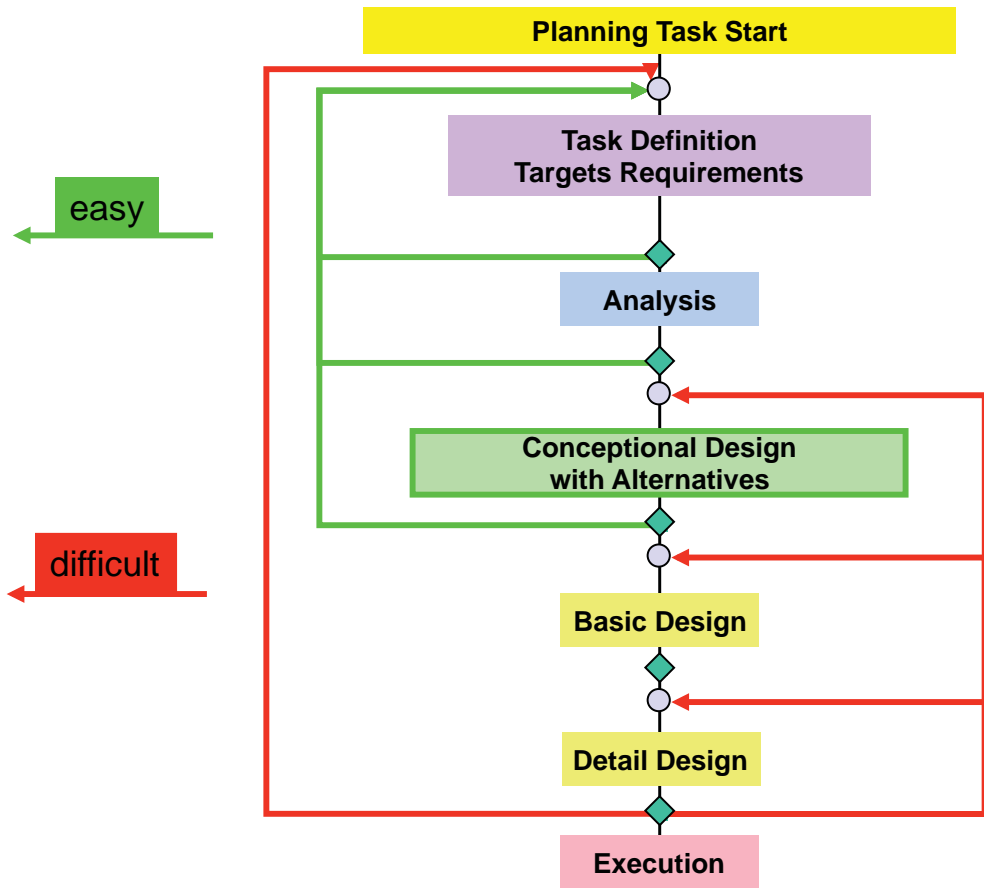


**It pays to invest into a strong conceptual design**

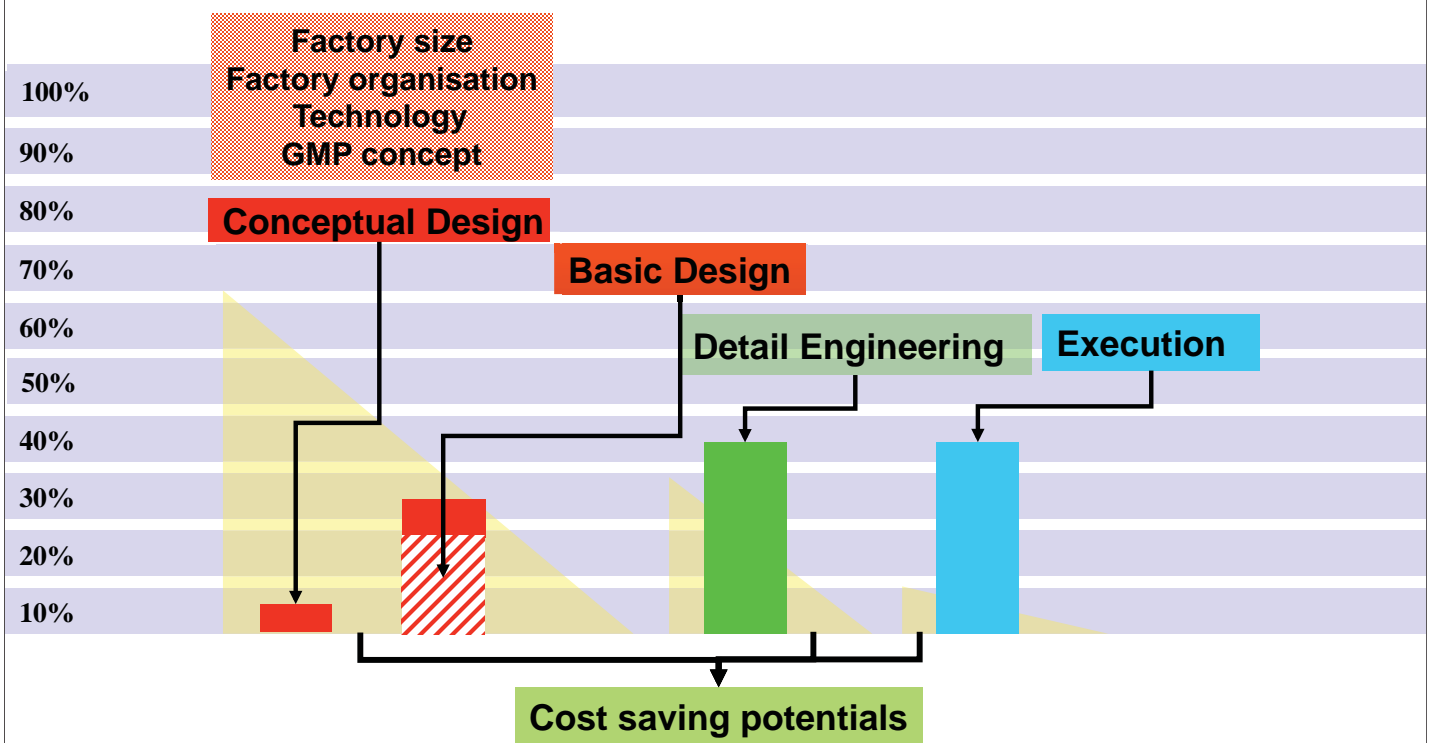
- Low initial costs
- Early clarification of main issues
- Powerful decision tool
- Possibility to develop alternatives
- “Freewheeling”



# PLANNING SEQUENCE AND ITERATION PROBLEMS

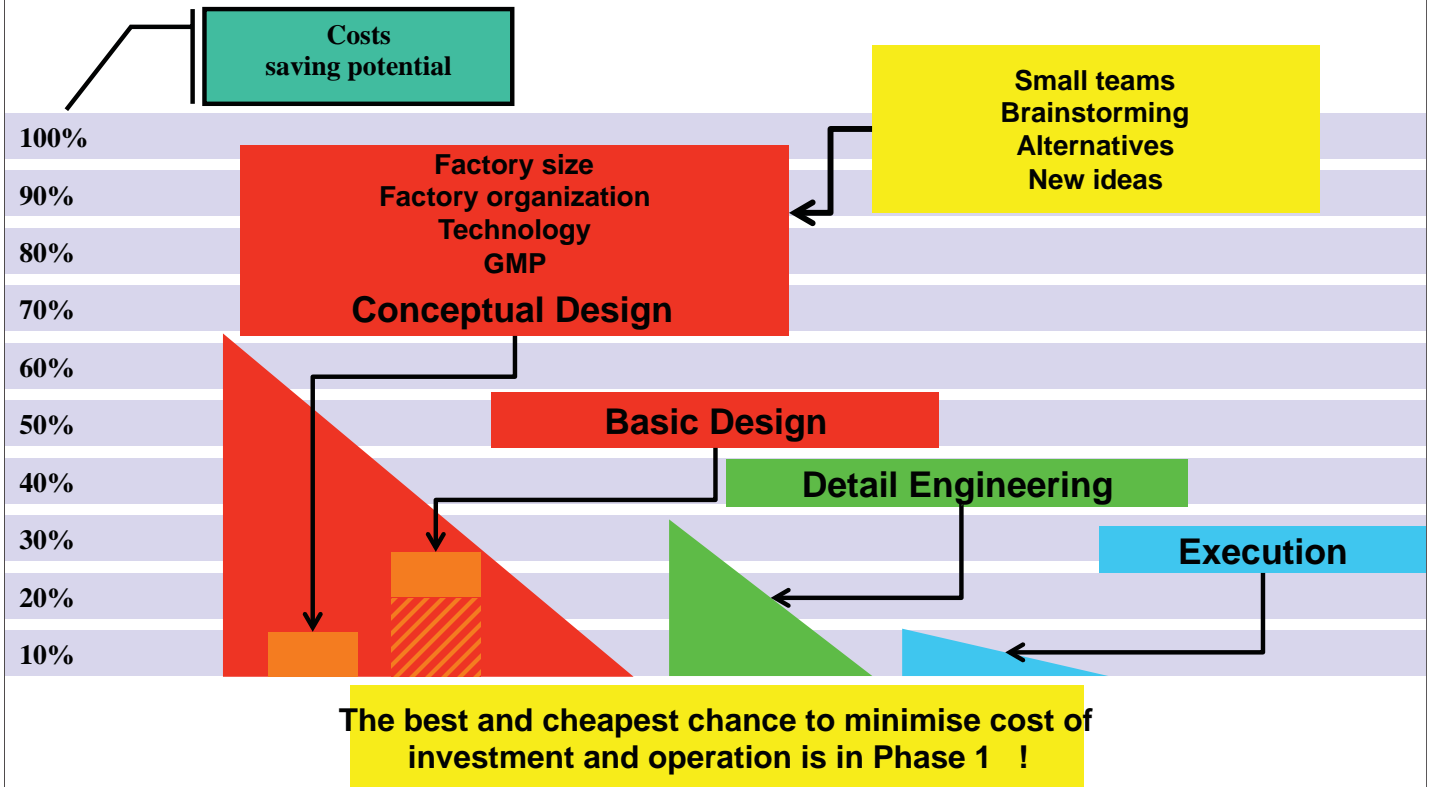


# RELATIVE COSTS OF THE DIFFERENT PHASES

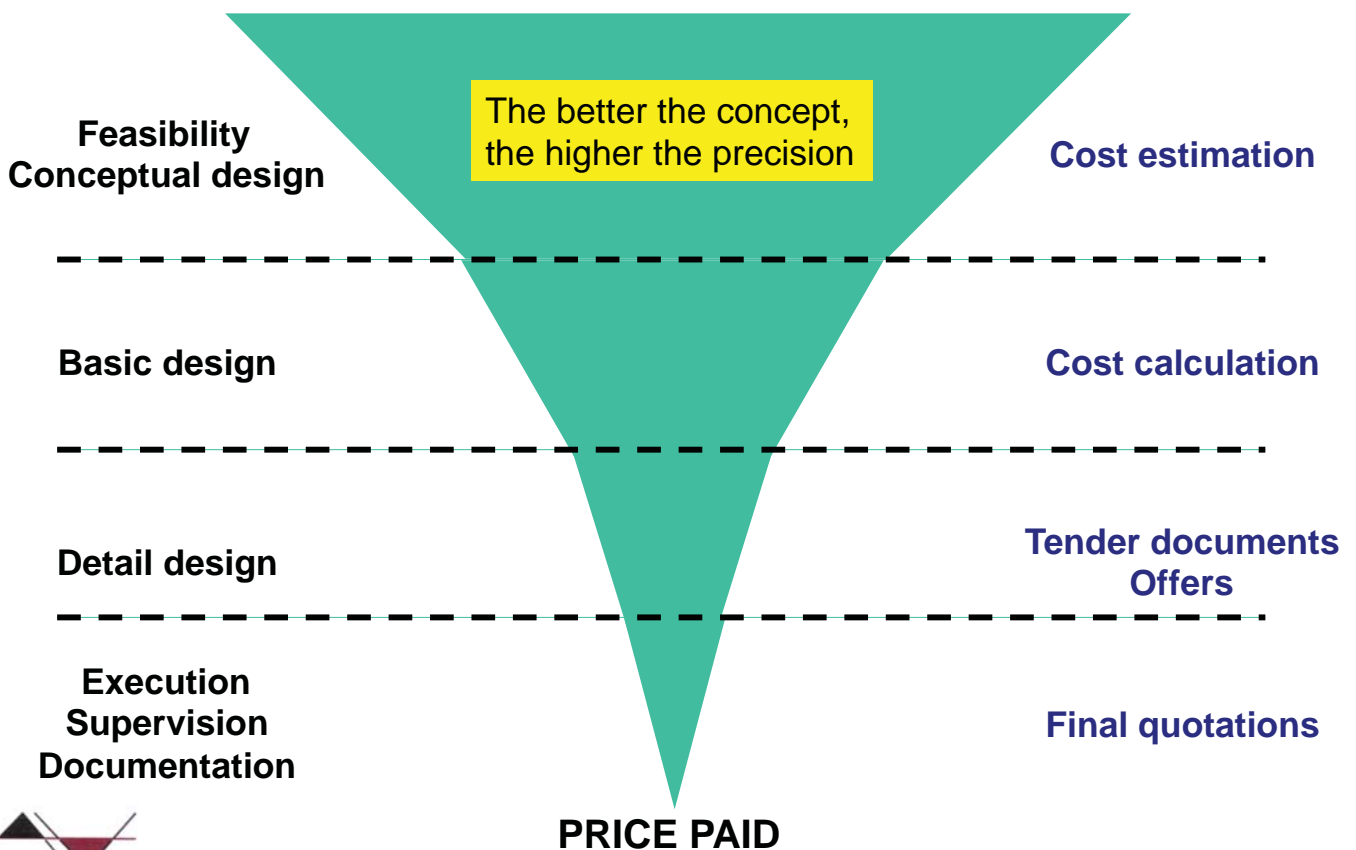


The cheapest and most promising Phase is the Conceptual Phase !

# POSSIBILITIES OF COST MINIMISATION



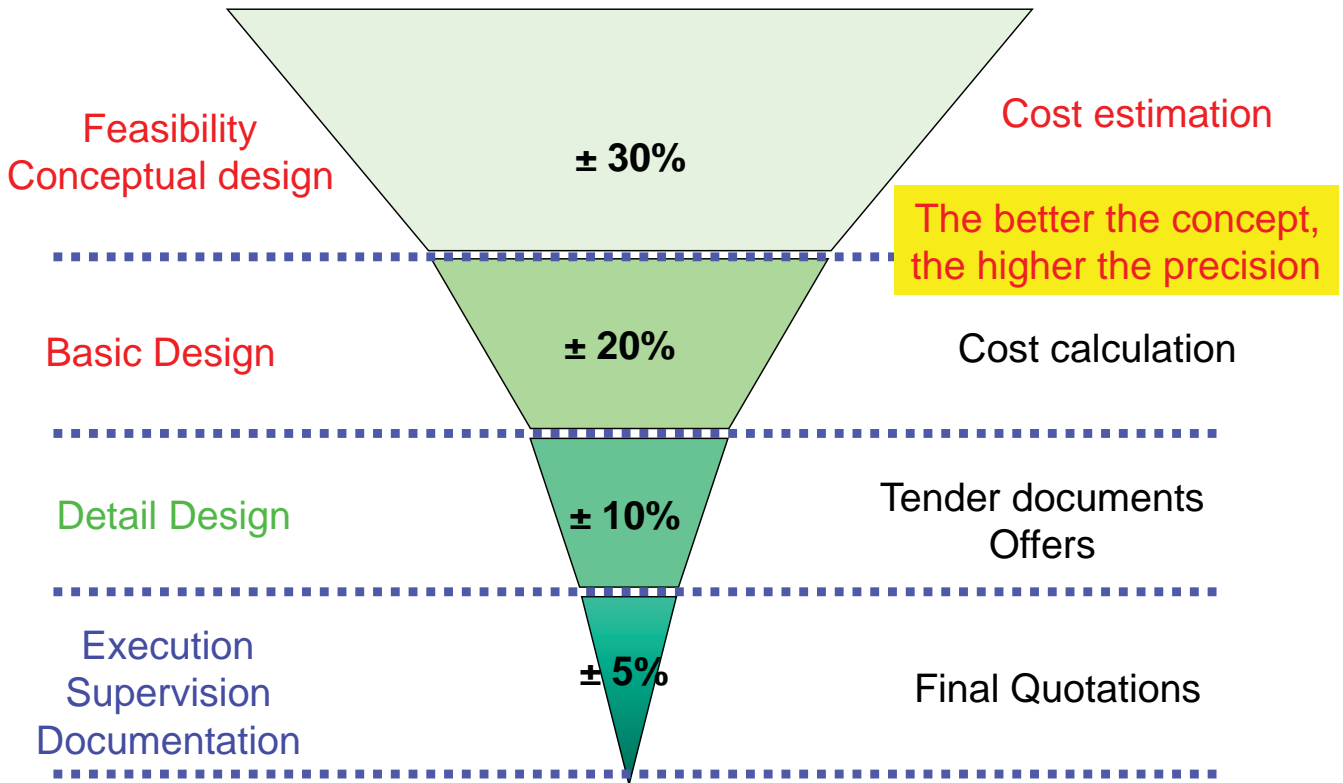
# DETERMINATION OF COSTS in relation to the planning stage





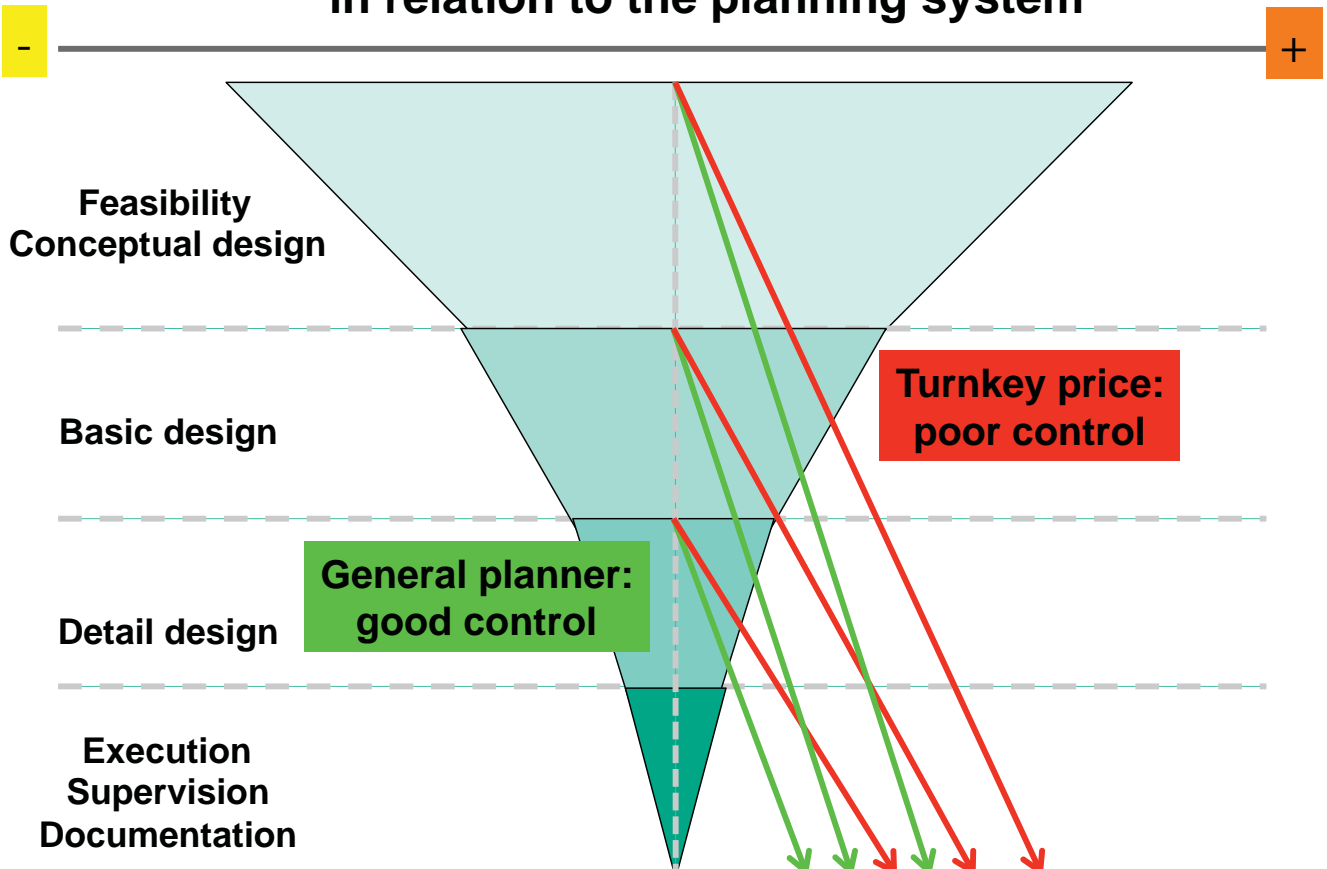
# PRECISION OF COSTS

## in relation to the planning stage stage



# DETERMINATION OF COSTS

## in relation to the planning system



# PURPOSE OF CONCEPTUAL DESIGN

## GMP Considerations and Factory Planning go Hand in Hand

The Purpose of the Conceptual Design is to arrive to

- Layout
- General Factory Organisation Procedures
- Hygiene Concept
- Technology Concept
- Air Handling and Utilities Concepts

which can be successfully presented to Authorities for a Pre-Approval Design Review

and to get a high degree of safety about

- Investments
- Schedule



# TARGETS OF PHARMACEUTICAL FACTORY PLANNING

- Planning of a production plant
  - future oriented
  - flexible
  - economical in investments and operating costs
  - GMP conform
  - conform to local / international regulations
- High motivation of staff by high quality of working place
- Efficient planning
- Adequate quality standard (value for money)
- Architecture compatible with local surroundings



# HOW TO REACH A GOOD CONCEPTUAL DESIGN RESULT ?

Right team

Good method Right team

Discipline Good method Right team

Good data Discipline Good method Right team

Some fantasy Good data Discipline Good method Right team

Some fantasy Good data Discipline Good method

Some fantasy Good data Discipline

Some fantasy Good data

Some fantasy



## PEOPLE AND PLANNING

### A Quote:

**“You do not really understand something unless you can explain it to your grandmother.”**

### Albert Einstein

**The idea is to work intensively with a small group of people, possibly detached from their daily chores.**

**These people must have the necessary know-how (or back-ups) and the power of decision**

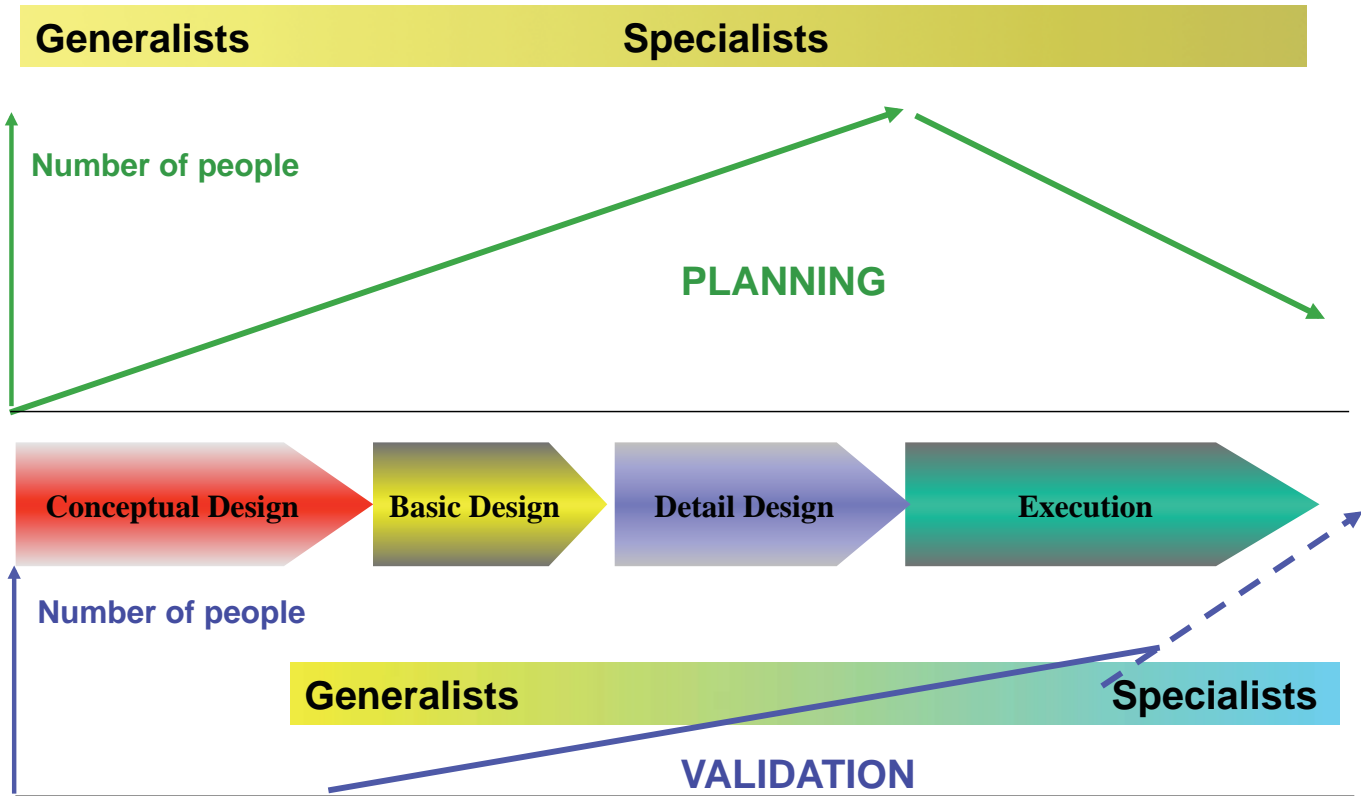


# PEOPLE AND PLANNING

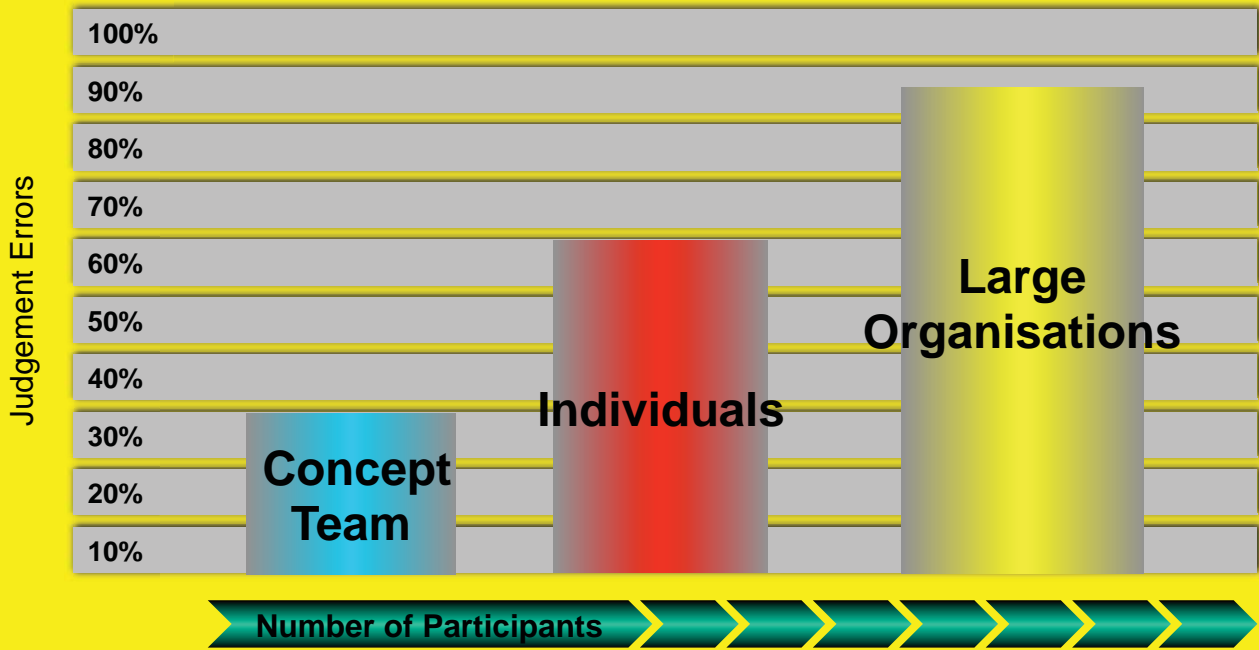
- CORE TEAM**
- Quality Assurance
- Production Manager
- Process GMP Expert
- Integrated Factory Planning Experts
- AD HOC MEMBERS**
- Utilities Specialist
- Controller
- Other Specialists
- Logistics
- Engineering



# PEOPLE AND PLANNING



# JUDGEMENT ERRORS



Role of participants :  
To plan AND to decide



# PLANNING METHODS

There are many design methods

By Experimenting and Innovating

By Adding Individual Functions

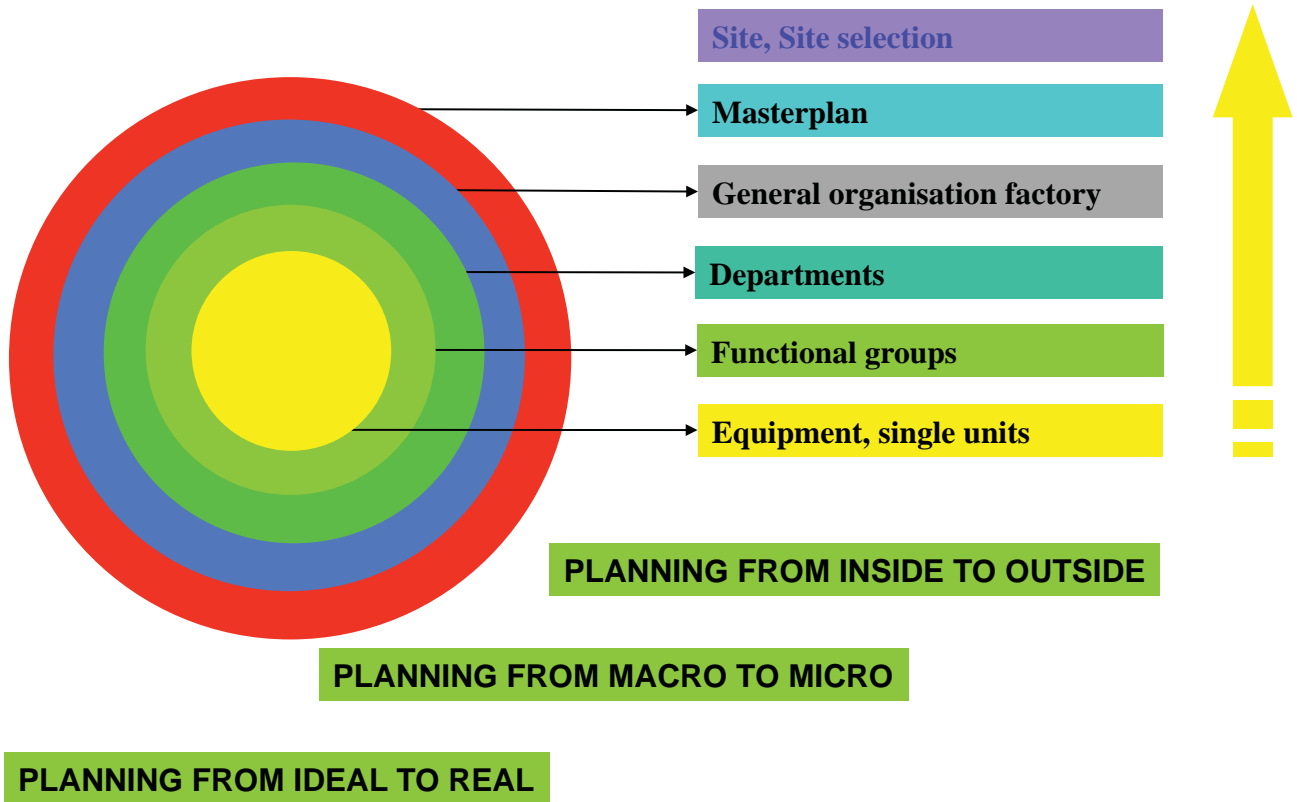
By Cloning Existing Units

By Systematic Planning

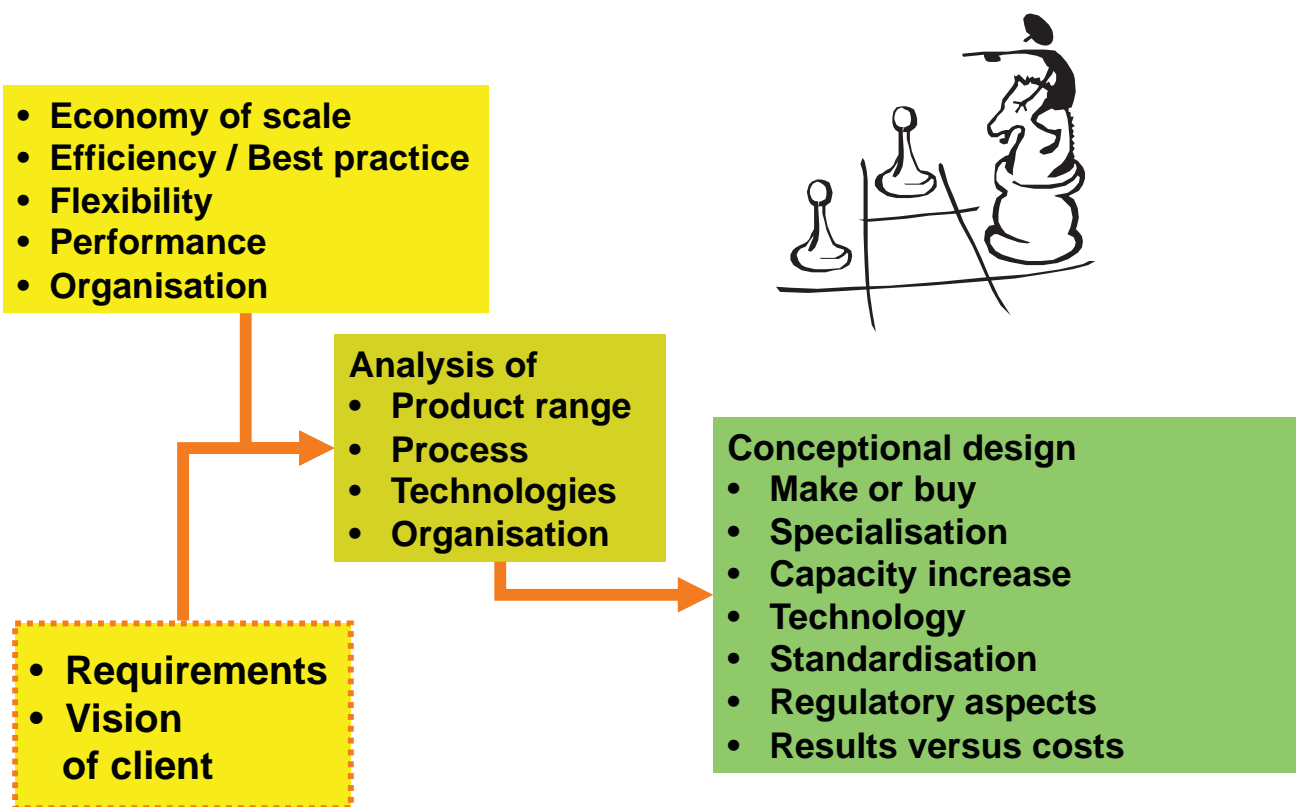
By Turnkey Contracting



# OPTIMAL PLANNING METHOD

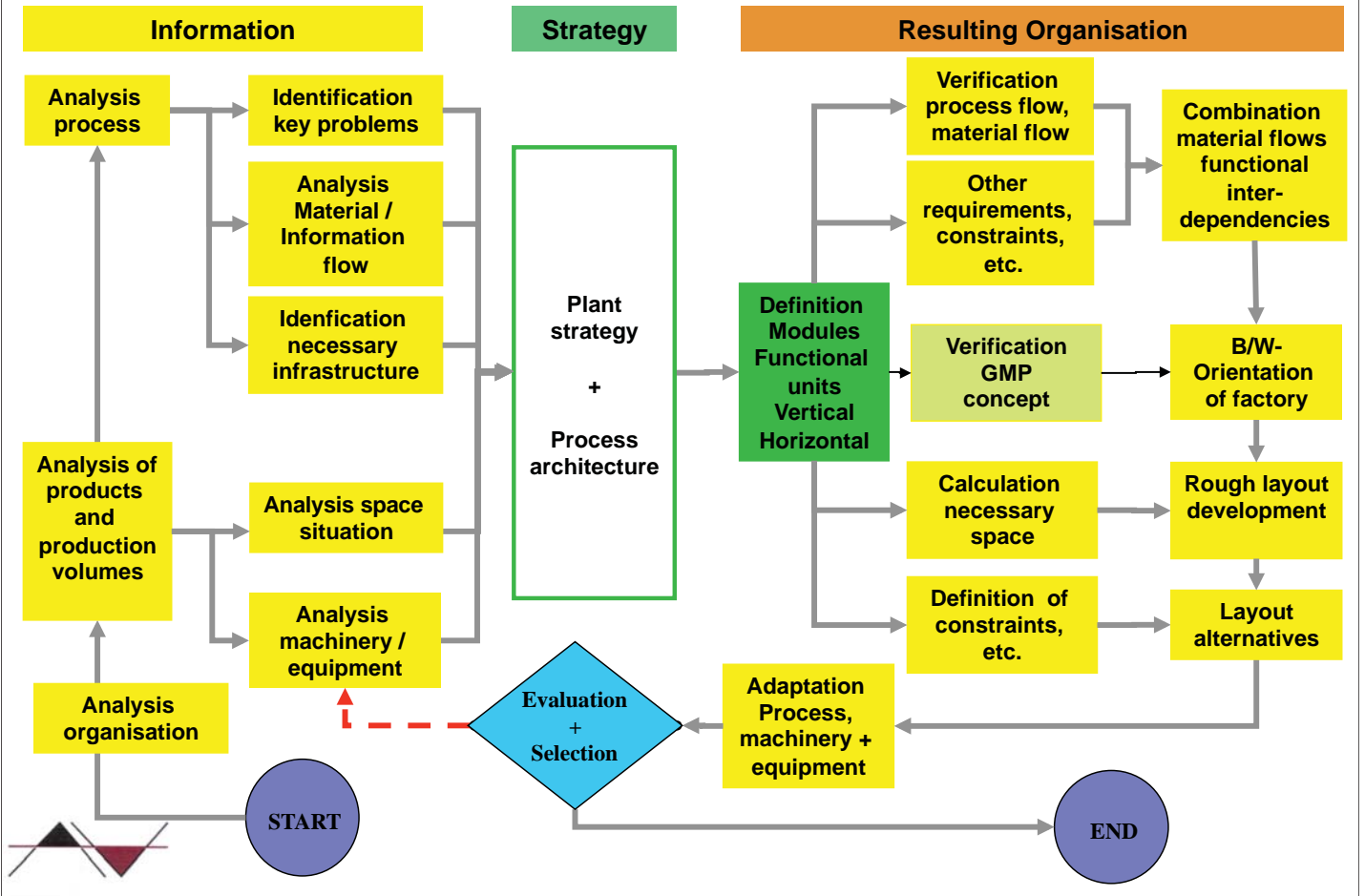


# NEED FOR FOCUSING



# PLANNING METHOD

## DEVELOPMENT OF IDEAL ORGANISATION

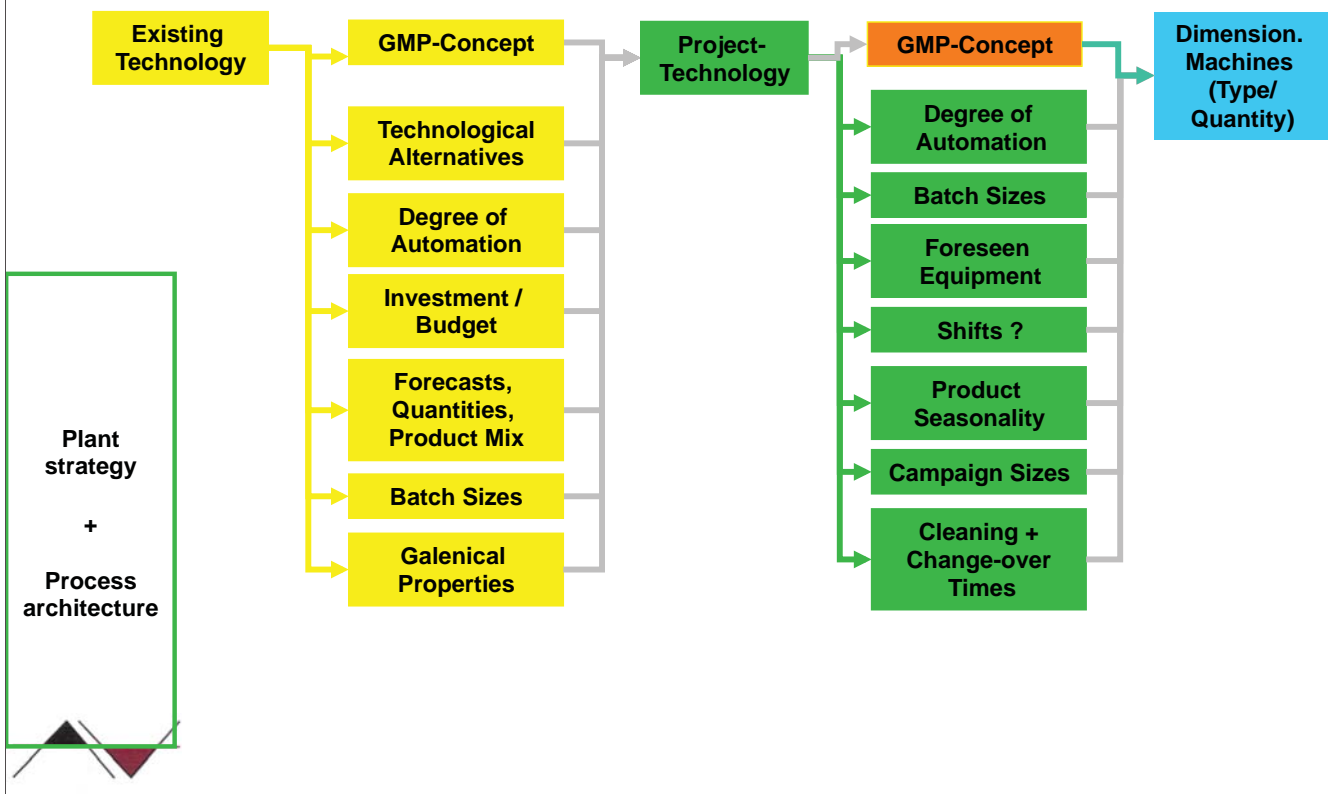


# PLANNING METHOD

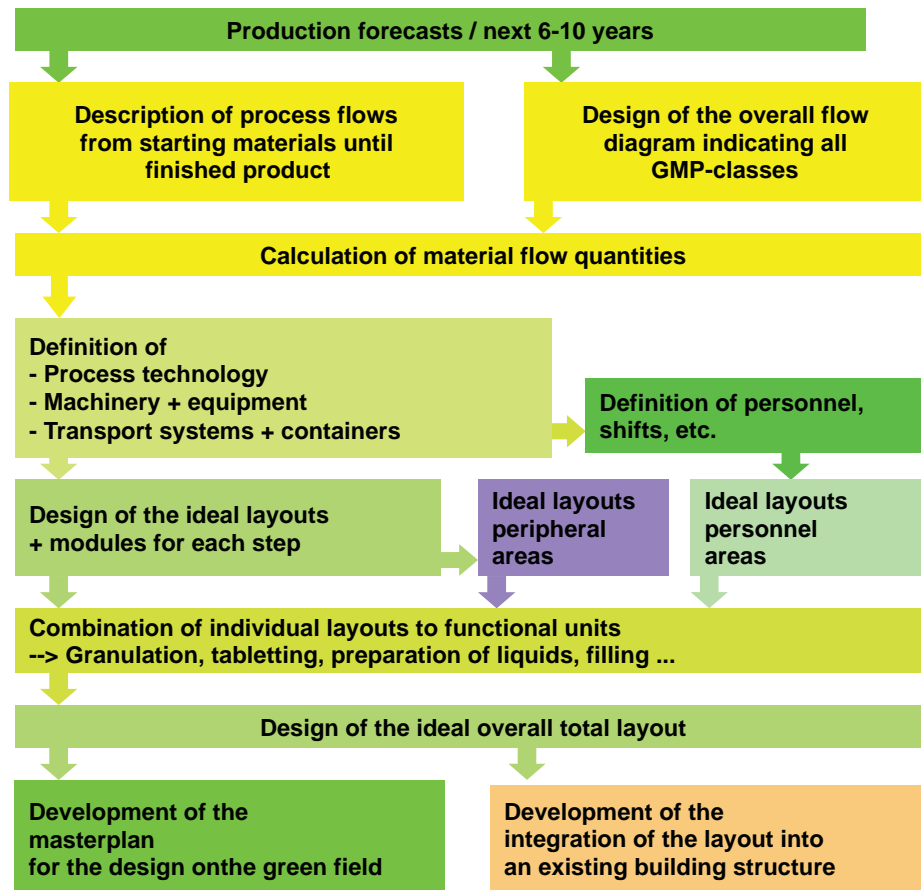
## RATIONALISATION, INNOVATION AND OPTIMISATION

### Morphological Analysis + Search for Solutions

### Capacity and Rationalisation Analysis



# PLANNING PROCEDURE: CONCEPTUAL DESIGN



# PLANNING PROCEDURE: CONCEPTUAL DESIGN FORECASTS

Product lists, quantities

Sorting by galenical forms

Sorting by types ("conventional", toxic, hormones, beta-lactames, etc.)

Strategy for marginal products (quantities, types, galenical forms):  
Make or buy





# ABC ANALYSIS

	Number of products		Volume of products	
		%		%
A		10		60
B		30		30
C		60		10

## Example

Number of products  
50  
Total number of units  
100.000.000  
Average weight unit (g)  
0,5

	Number of products		Volume of products	
	%		%	kg
A	10	5	60	30.000
B	30	15	30	15.000
C	60	30	10	5.000



## SELECTION OF TECHNOLOGY AND EQUIPMENT EXAMPLES OF SELECTION FACTORS

- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client:  
size, degree of sophistication, automated guided vehicles, architecture, budget, future-oriented or not
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed:  
eg granulation properties: is direct compression possible or dry granulation ?
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed:  
type of granulation, aseptic processing or terminal sterilization,  
ampoules or syringes
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues



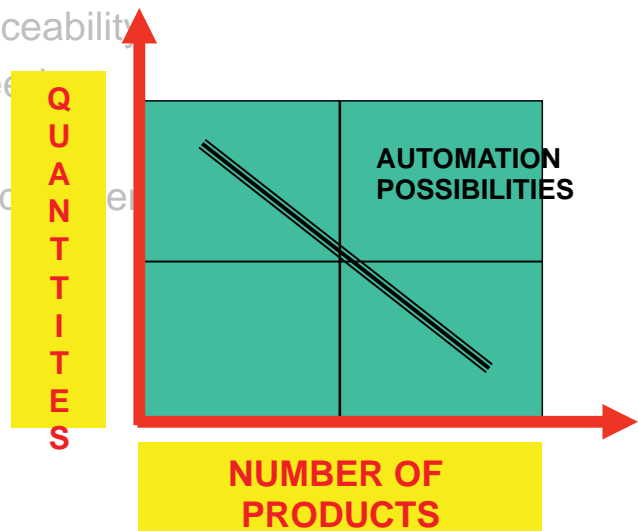
# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed
- Output requirements  
High capacity / one shift, low capacity / 2 or 3 shifts
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication  
fully automated preparation of solutions, with CIP/SIP, equipment for solids with CIP capability, cartoning, palettisation, etc.
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
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# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- **Space constraints**  
Can influence the type or the supplier: eg difference in size between FBG and “one-pot” system
- Previous experience, available equipment (standardization)
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- **Previous experience, available equipment (standardization)**
- GMP issues
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues  
Aseptic processing problems: automated loading of freeze-dryer, increased automation
- Safety of operator



# SELECTION OF TECHNOLOGY AND EQUIPMENT

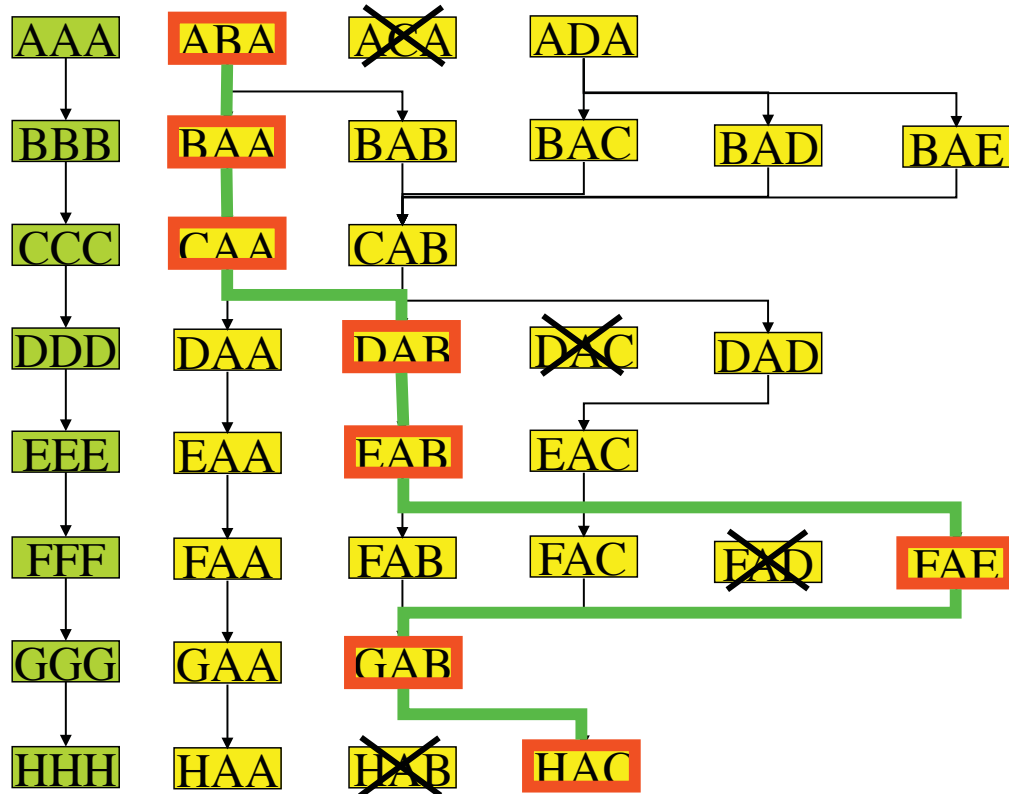
- Vision of client
- Properties of products to be processed
- Output requirements
- Degree of automation, sophistication
- Supplier: price, service and serviceability
- Cleanability and maintenance needs
- Space constraints
- Previous experience, available equipment (standardization)
- GMP issues
- Safety of operator: containment or PPE ?

**In most cases, several factors will play a role simultaneously**



# SELECTION OF TECHNOLOGY AND EQUIPMENT MORPHOLOGICAL ANALYSIS

P  
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PROCESS ALTERNATIVES

## PLANNING METHOD

### PROCESS AND ORGANIZATION FLOW CHARTS

Whereas a process flow chart reflects the process only, an organization flow chart includes the process, its organization as well as additional elements such as quantities, personnel needs, hygiene zoning, equipment and inter-relationships within the production or between production and related functions.

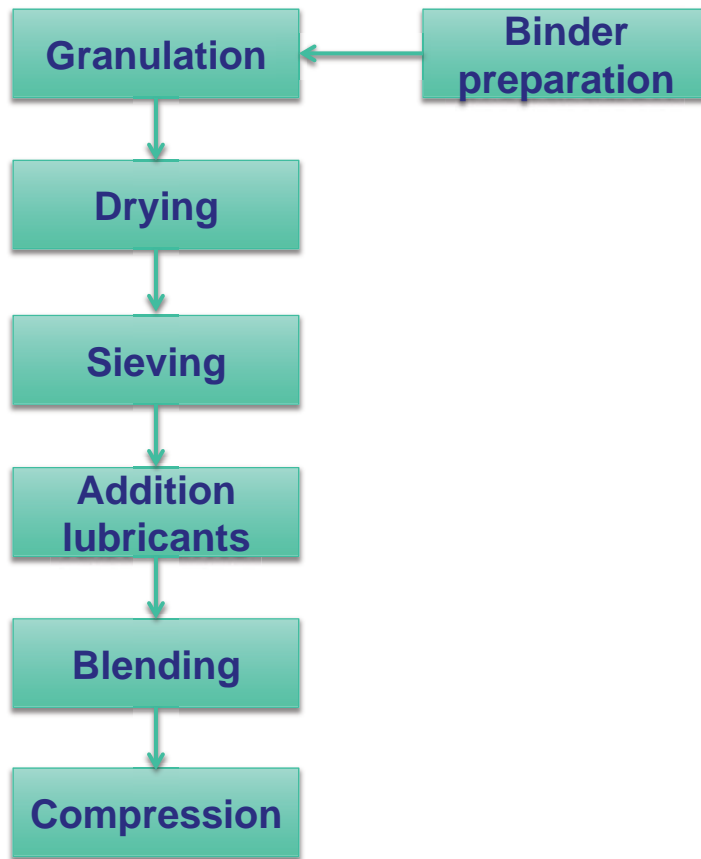
The process flowchart must be transformed into an organisational flow chart

Organization flow charts exist at different levels, micro- and macro:

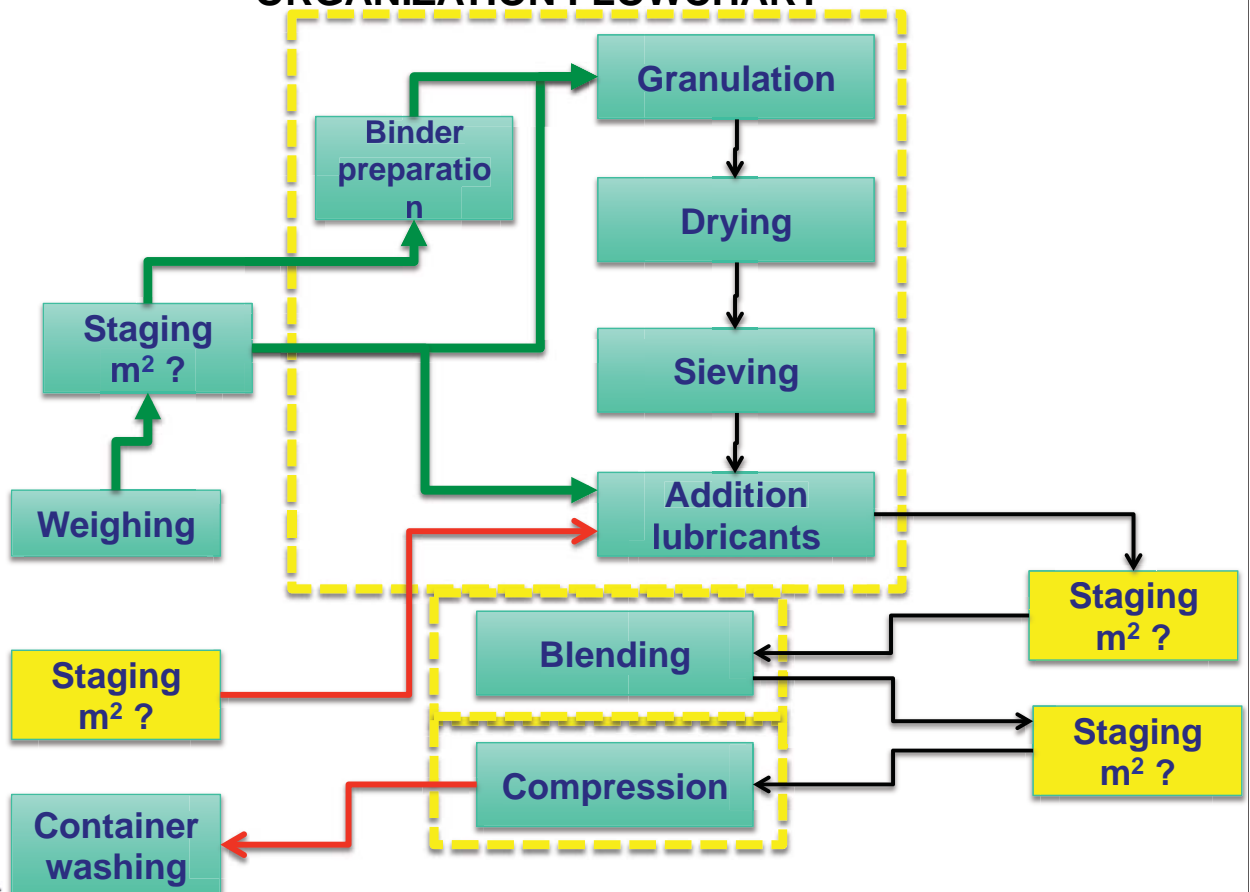
Micro: within a department

Macro: within a production unit/plant

# PLANNING METHOD PROCESS FLOWCHART



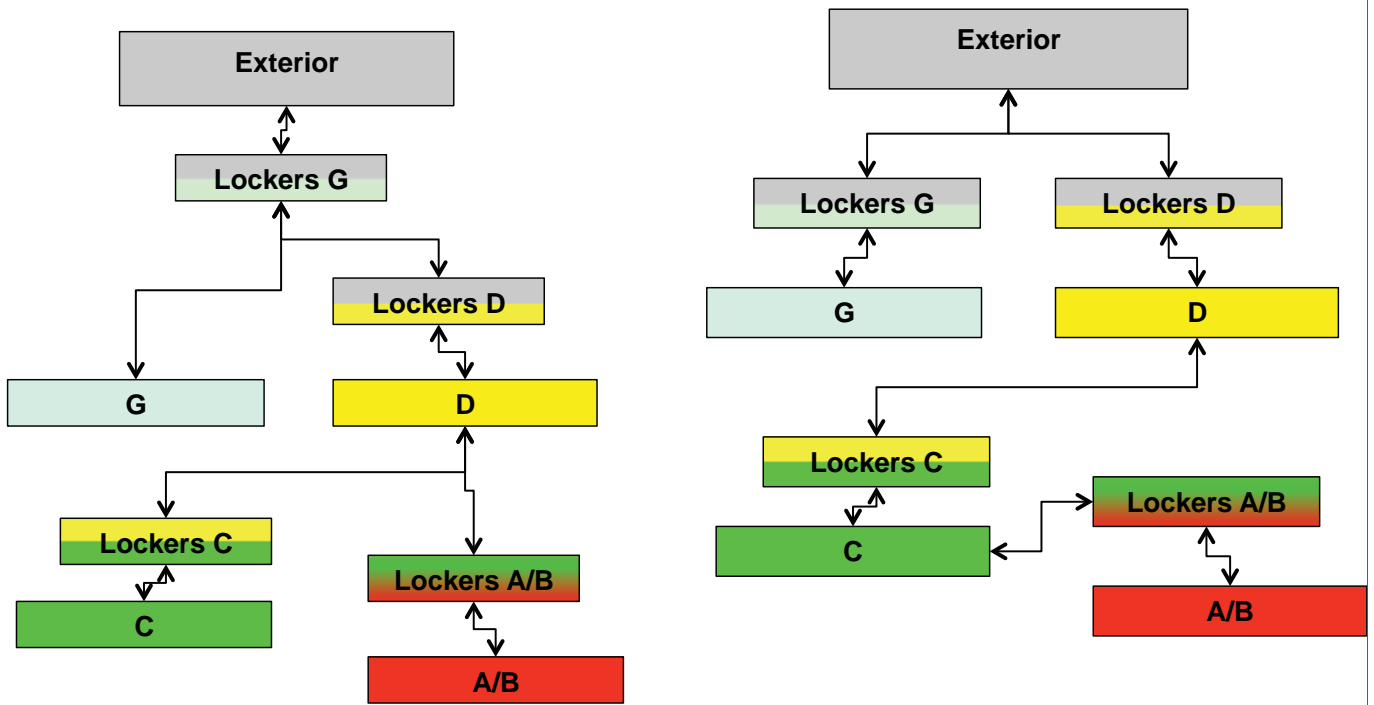
# PLANNING METHOD ORGANIZATION FLOWCHART





# PLANNING METHOD

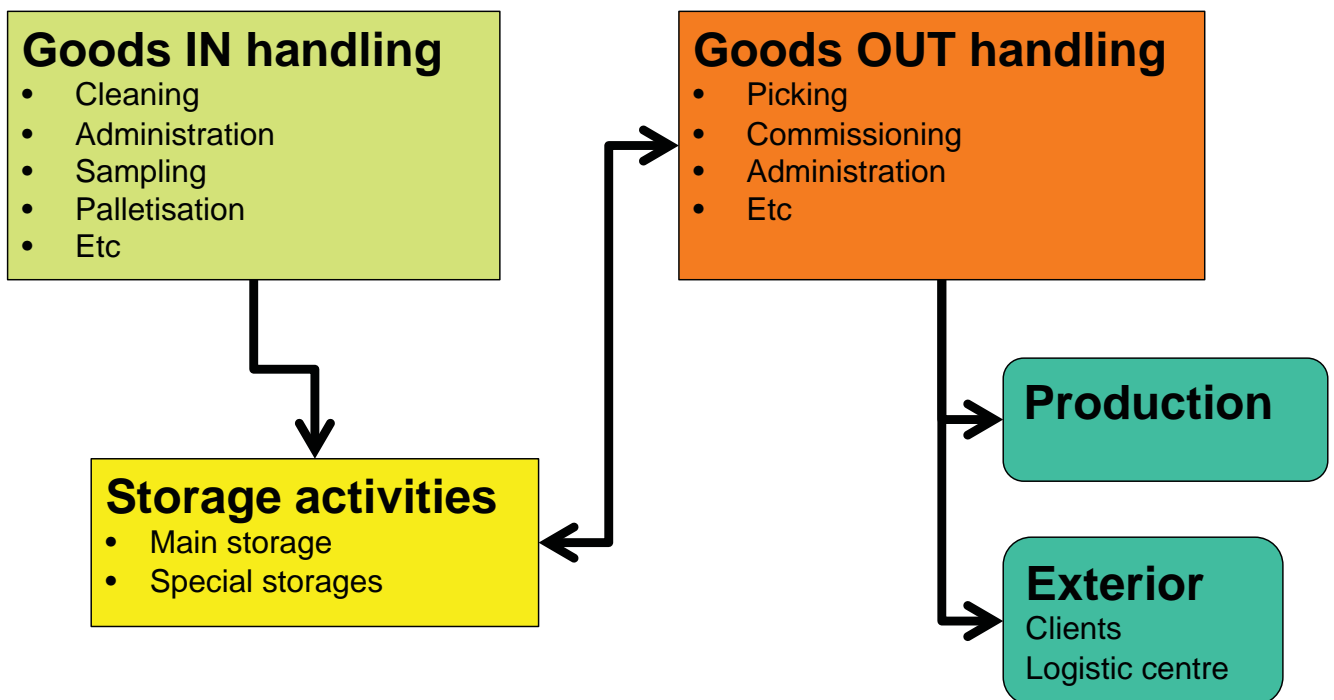
## FLows PERSONNEL AND MATERIALS



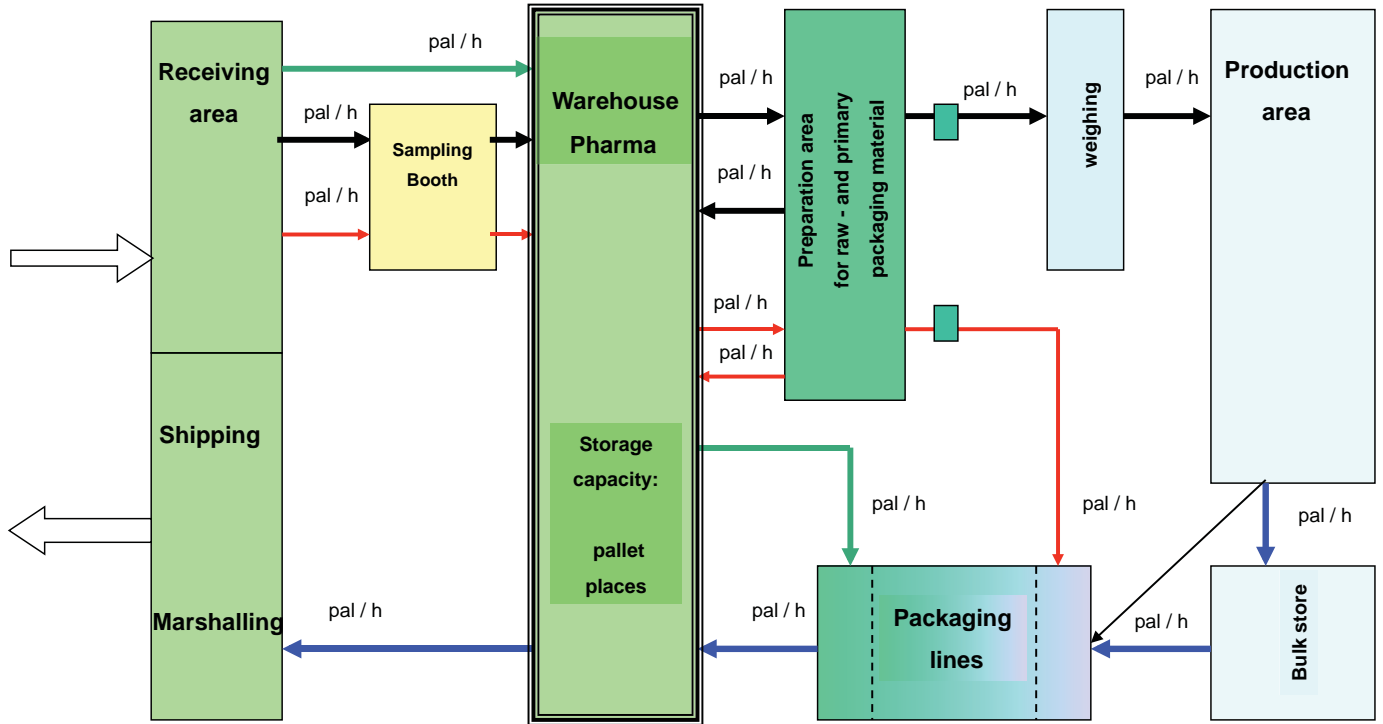
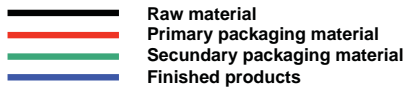
Selection of alternative important, later changes practically impossible



# LOGISTICS



# LOGISTICS



Sampling  
Quarantine separation

Change of pallets to/from production  
Procedures in material air locks

## « GOOD GMP »

- Minimized risk of contamination / cross-contamination
- Clear material flows (uni-directional whenever possible)
- Clear personnel flows (uni-directional whenever possible)
- Unambiguous definition of GMP zones
- Separation clean – dirty (washing areas)

Overkill  
 Cost issues  
 Nice to have  
 GMP is not an attribute, no black and white attitudes

# SUMMARY

A good pharmaceutical factory is a factory that is:

- Pharmaceutically approved (qualification / validation )
- Economical to operate and maintain
- Flexible and adaptable quantity-wise and for new technologies

To design such an excellent pharmaceutical plant, an integrated, multi-disciplinary and experienced team is required.

The objectives, the vision, the method and the involvement of each member of the team will achieve this goal, and not the principle “function follows adding up individual inputs”

