



Aalto University

# Procurements and contracts

CIV-E1040 Construction Management

*Lecture 5a*

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# Previous lecture

- **Life-cycle analysis methods: process and input-output**
- **Life-cycle cost analysis method**
- **Quality management in construction: definitions and practices**
- **Safety management methods and practices**

# Procurements in construction

# Learning outcomes

**“Describe role and tasks of procurement and contracts in construction”**

- **Procurements in construction**
  - Role of procurements
  - Procurement types
  - Relationship between delivery method and procurements
  - Procurement process
- **Contracts in construction**
  - Delivery method vs. procurements and contracts
  - Competitive bidding
  - Content of contracts

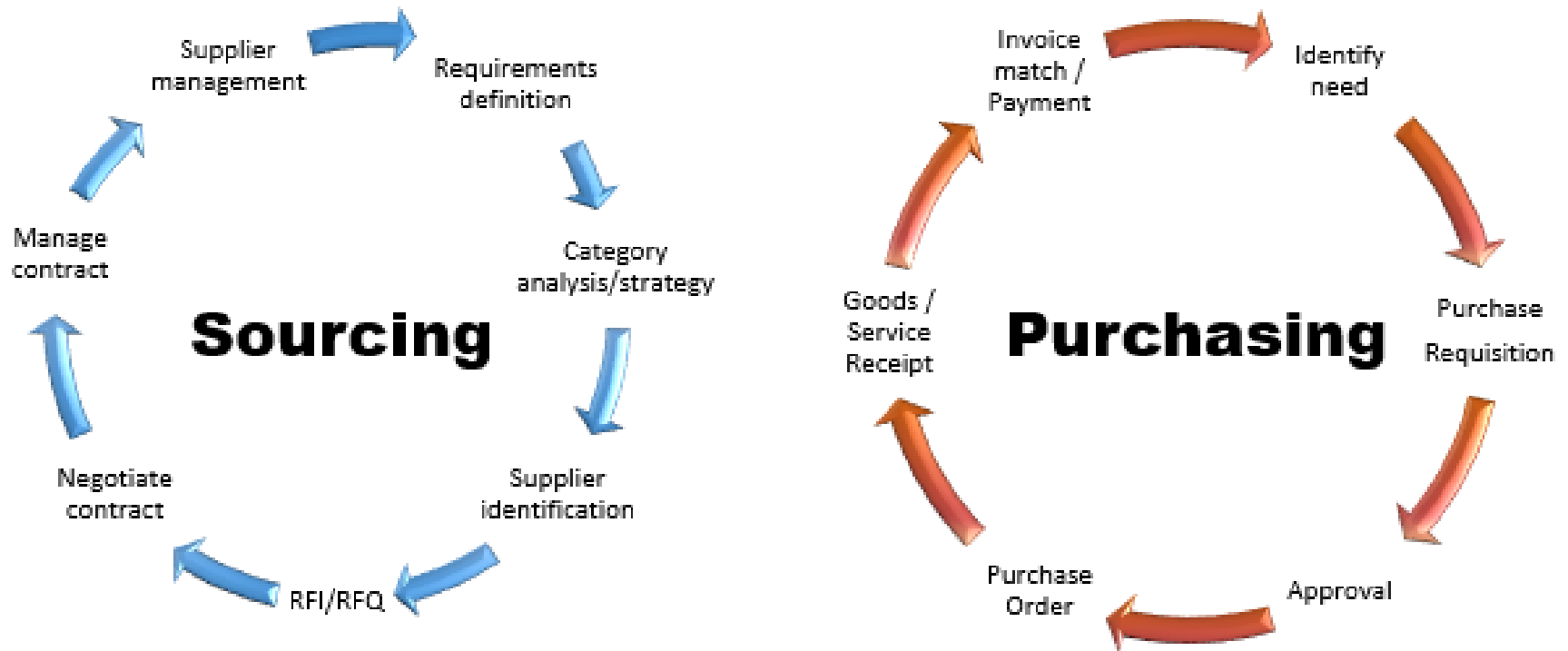
# Procurement - definition

”the act of finding, acquiring, buying goods, services or works from **an external source**, often via a tendering or competitive bidding process”

-Wikipedia

# Sourcing vs. purchasing

## PROCUREMENT



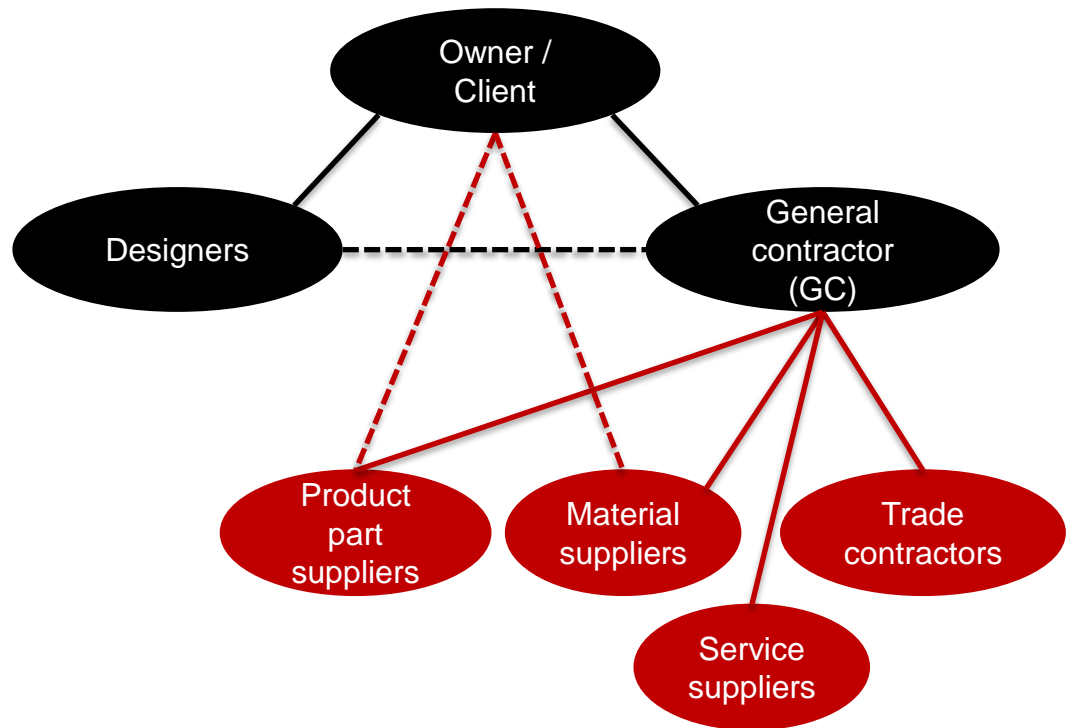
# Hierarchy of procurements in construction

**1. Procurement of designers and general contractor**

= Owner's selection based on a selected delivery method

**2. Procurement of product parts, material, work and services**

= Mostly General Contractor's responsibility during the contract period



# Owner's procurement of a general contractor

1. What project delivery method?

2. What procurement method?

3. What contract format?

| Project delivery method                        | Procurement method          | Contract formats         |
|--|-----------------------------|--------------------------|
| Design-Bid-Build (DBB)                         | Best Value                  | Cost Plus Fee            |
| Construction Management at Risk (CMR)          | Low Bid                     | Guaranteed maximum price |
| Design-Build (DB)                              | Negotiated                  | Lump sum (fixed price)   |
| Alliance and Integrated project delivery (IPD) | Qualifications-based        | Target price             |
| Lifecycle delivery methods                     | Sole source (direct select) | Unit price               |



# Procurements – typical division of project costs from General Contractor perspective

- Labour costs 10 %
- Material costs 35 %
- Sub-contracts 50 %
- Nominated sub-contracts 5 %

**Share of procurements 80-90 %**

10 M€ project

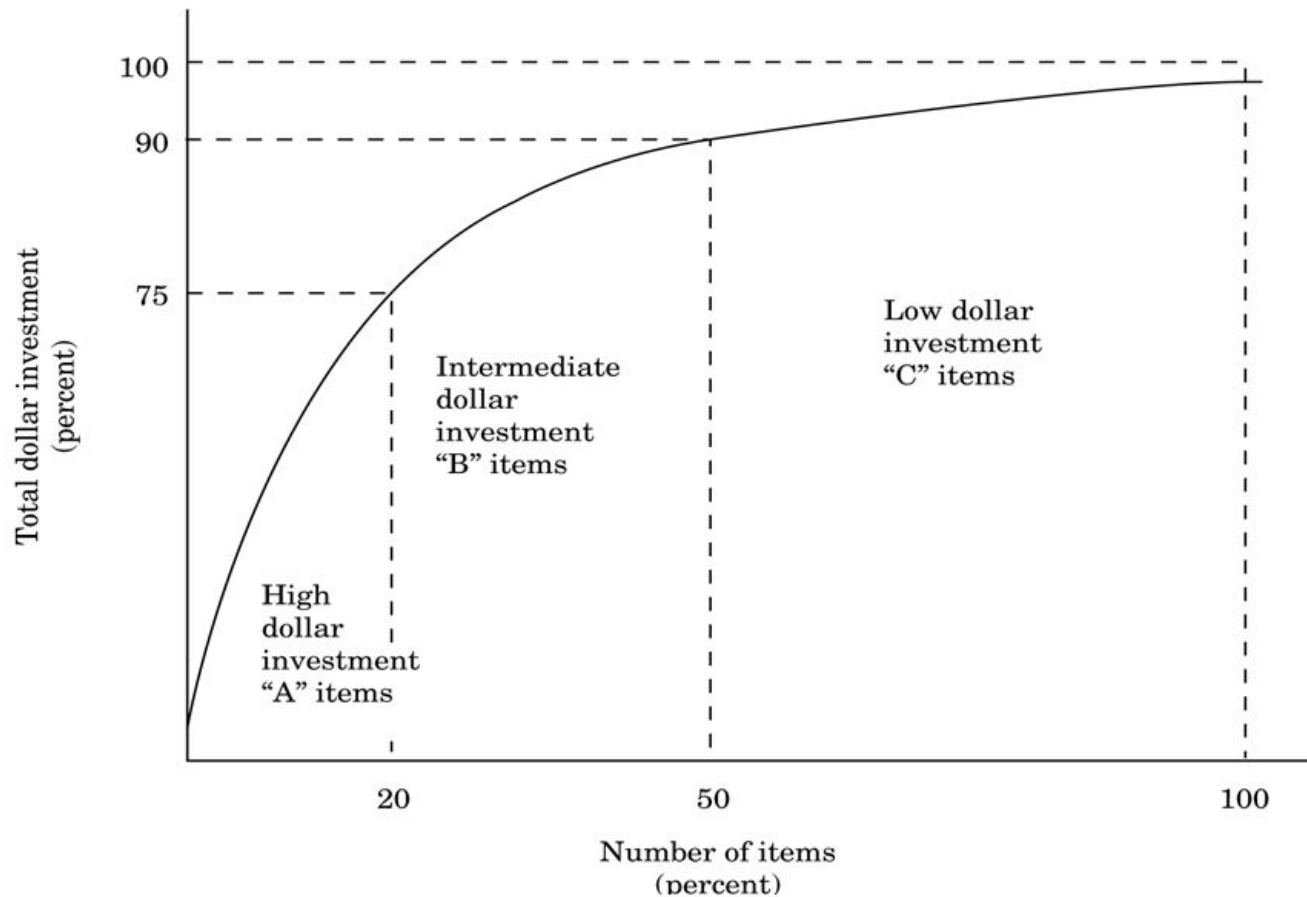
→ procurements 8 M€

→ 1 % savings = 80 k€

→ **5 % savings = 400 k€ = XX % of the GC's own costs?**



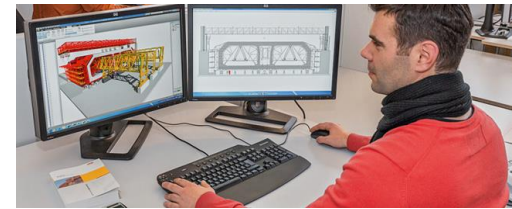
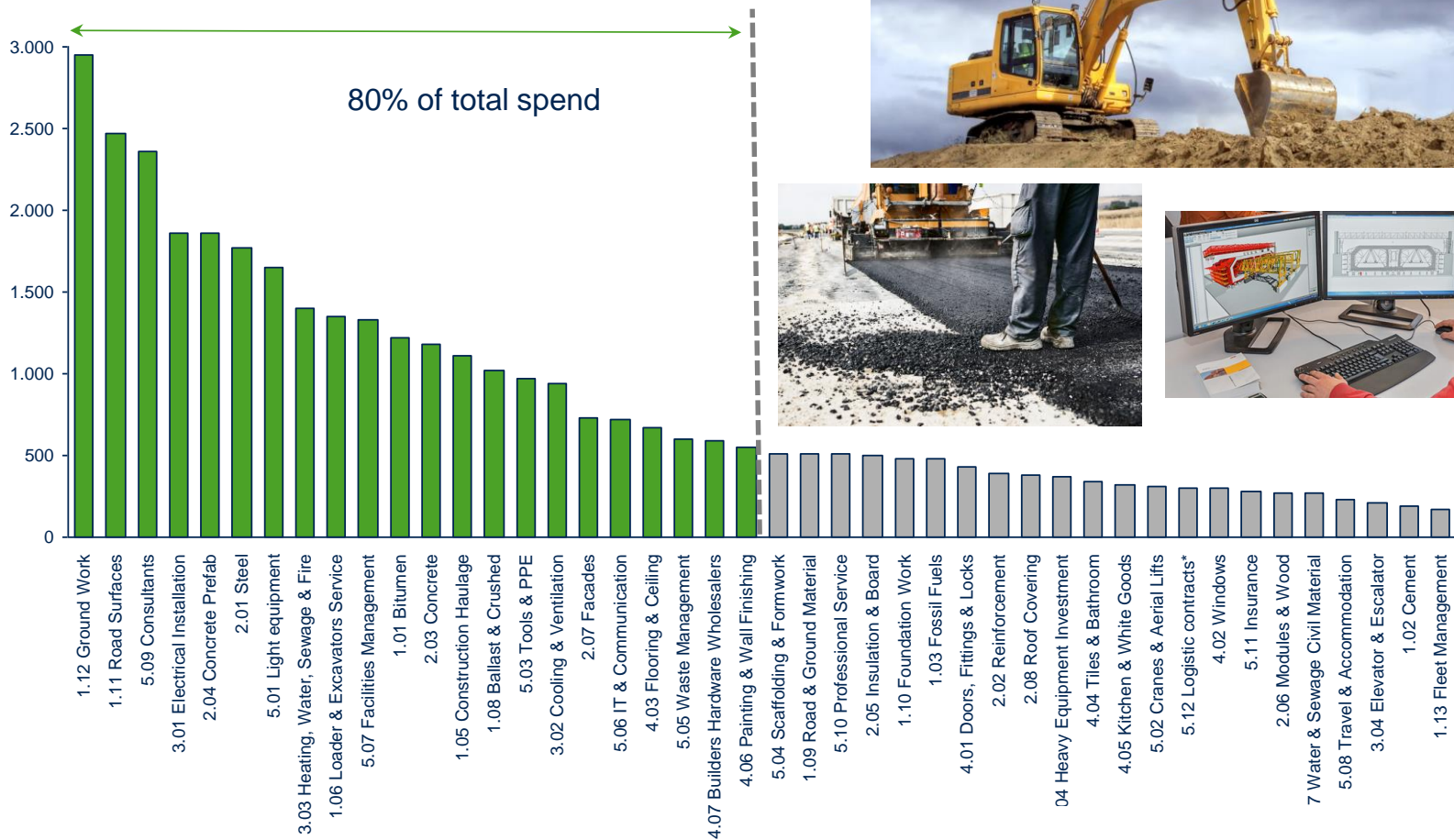
# ABC classification of procurements and 80/20 rule



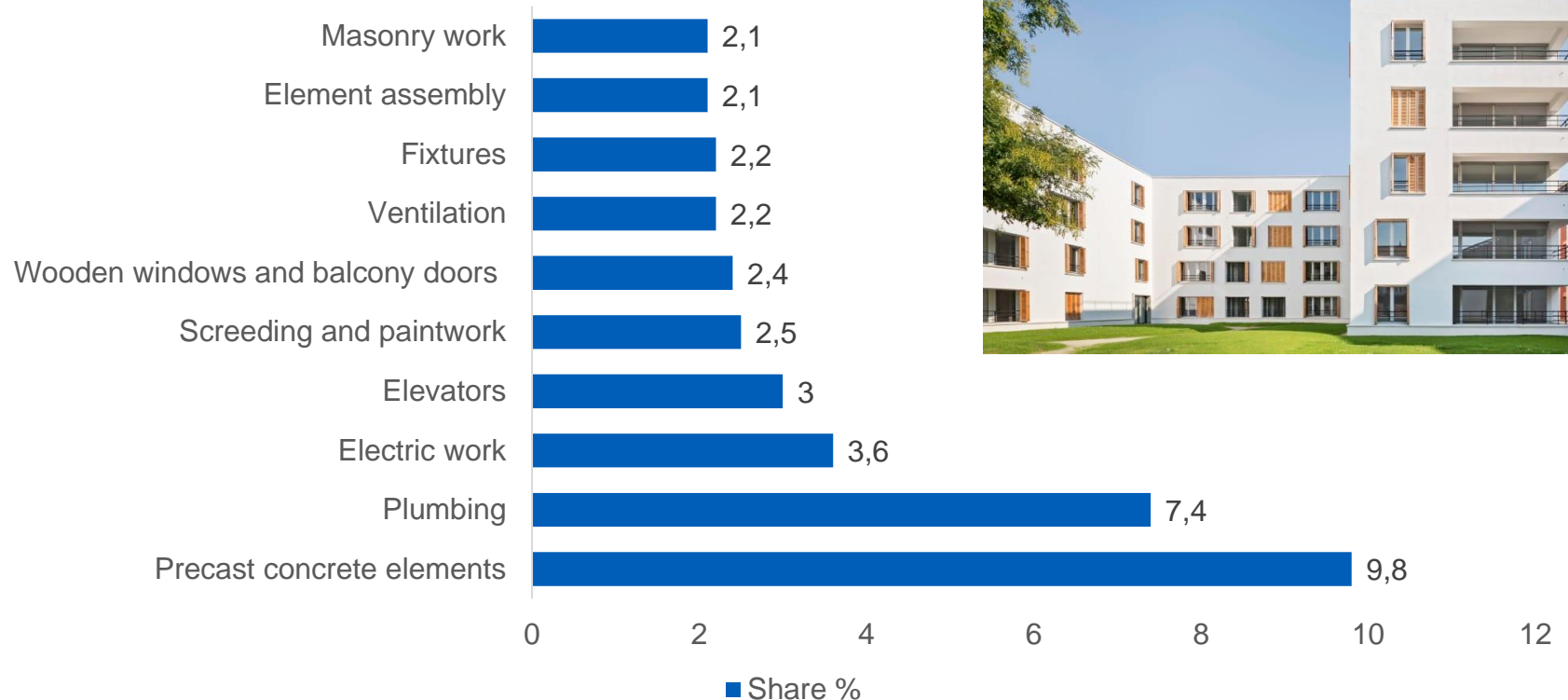
\* From Leenders, Johnson, Flynn, and Fearon, *Purchasing and Supply Management*, Thirteenth Edition, McGraw Hill Irwin

# Example 1: Value of procurement categories of a Finnish Contractor

The top 10 categories represent some 48% of the spend and 22 categories represent 80% of the total spend



# Example 2: 10 biggest procurements in a residential building project



# Procurement types

**Volume items**



**Small items**

**Project specific**

- Engineer-to-Order, ETO



**Standard**

- Make-to-Stock/Order

**Materials** ↔ **Product parts** ↔ **Contracts** ↔ **Services / Labour**

**Centralized procurements**

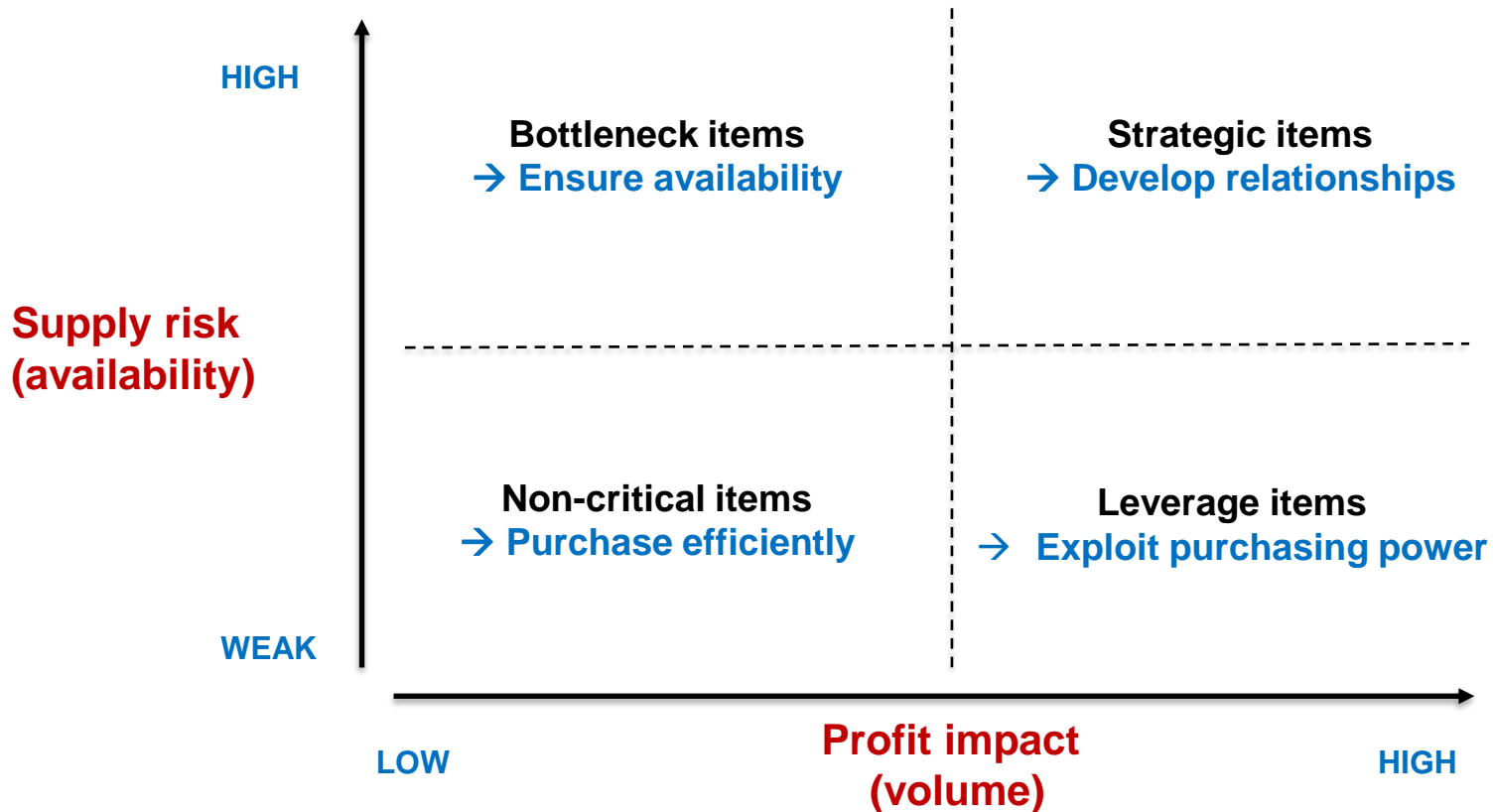
- Company's procurement function
- Framework agreements



**Decentralized procurements**

- Project organization

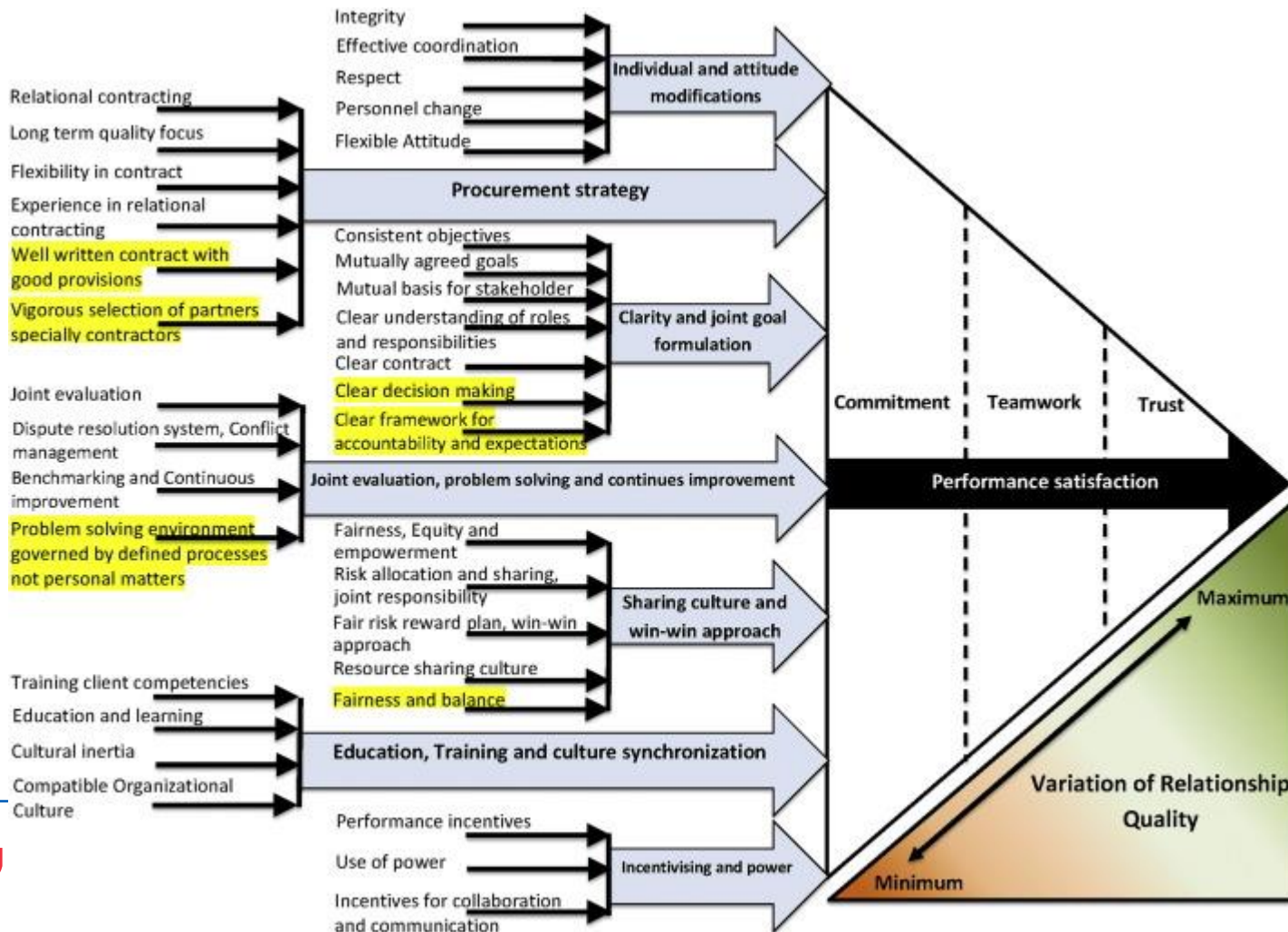
# Procurement strategies according to supply risk and profit impact



# Applying procurement strategies in construction

| Strategy                 | Main tasks  | Example of items (depends on project!)  | Main responsibilities   |
|--------------------------|---|---|---|
| <b>Strategic items</b>   | <ul style="list-style-type: none"> <li>Detailed market research</li> <li>Development of long-term supply relationships</li> <li>Make-or-buy decisions</li> </ul>        | <ul style="list-style-type: none"> <li>Precast concrete elements</li> <li>Electrical installations</li> <li>Building services</li> <li>Ground work</li> </ul>   | Purchasing department   |
| <b>Bottleneck items</b>  | <ul style="list-style-type: none"> <li>Volume insurance (or cost premium)</li> <li>Back-up plans</li> </ul>   | <ul style="list-style-type: none"> <li>Special sub-contractors (e.g. hospital equipment, metal works)</li> </ul>  | Purchasing department   |
| <b>Leverage items</b>    | <ul style="list-style-type: none"> <li>Vendor selection / blanket agreements</li> <li>Product substitution</li> <li>Targeted pricing strategies/negotiations</li> </ul> | <ul style="list-style-type: none"> <li>Wooden windows</li> <li>Concrete</li> <li>Hollow core slabs</li> <li>Standard furniture</li> </ul>   | Purchasing department (contracts) and project organization (orders) |
| <b>Noncritical items</b> | <ul style="list-style-type: none"> <li>Product standardization</li> <li>Inventory optimization</li> </ul>   | <ul style="list-style-type: none"> <li>Bulk materials                             <ul style="list-style-type: none"> <li>Insulators</li> <li>Nuts and bolts</li> <li>Sheets</li> <li>Screeds</li> </ul> </li> </ul> | Project organization  |

# Relationship quality framework: It's not just a bunch of material on site...





# Procurement is not just competitive bidding

Three main flows on an international contractor:

1. **Make-to-Stock items**
  - Focus on **purchasing power** and **efficient logistics**
2. **Make-to-Order/Engineered-to-Order items**
  - Focus on **cost-effective design solutions**, efficient manufacturing & **installation**
3. **International supply chains**
  - Focus on **headquarter's purchasing power**, shared resources, logistics

**Procurement is responsible for an efficient (cost & agile) supply chain!**

# Check-point: Which of the following statements is not correct?

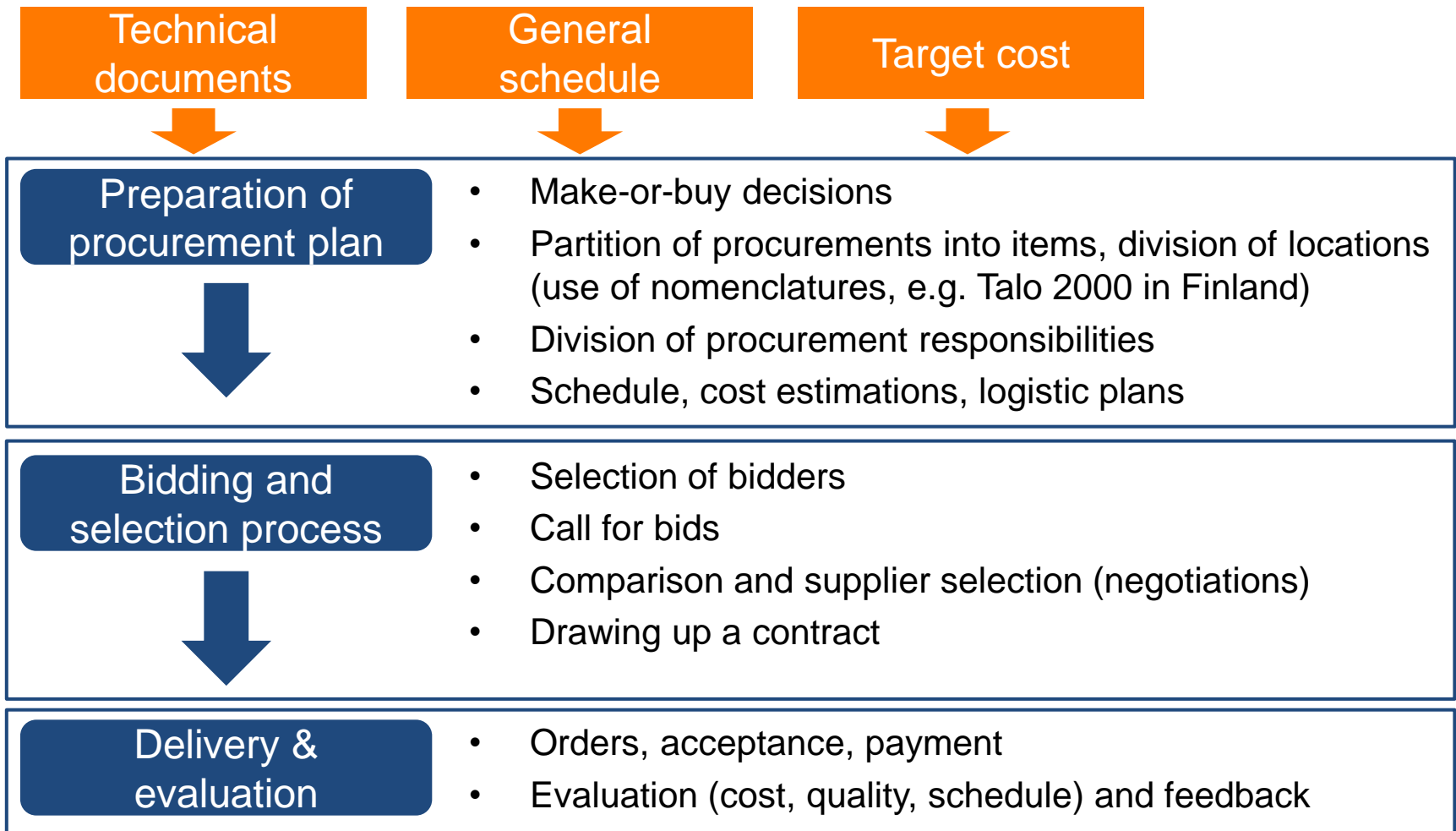
- **Statements:**
  - A. In bottleneck items, it is critical to ensure availability**
  - B. Strategic items should be procured project-by-project**
  - C. Non-critical items should be purchased efficiently**
  - D. In leverage items, contractor should use its purchasing power**



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# Procurement process

# Procurement process during project



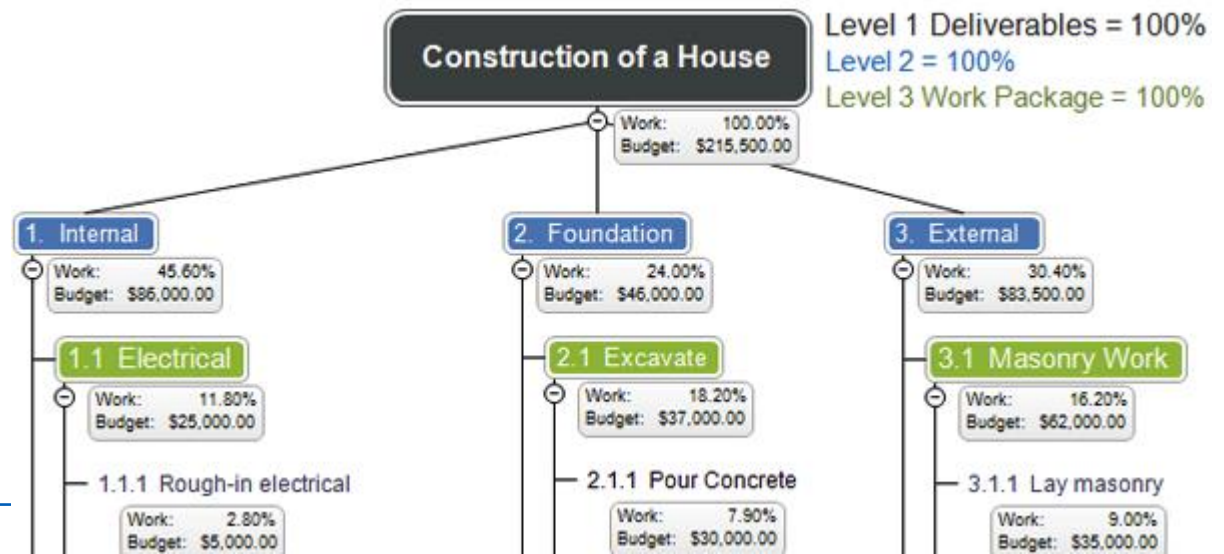
# Strategies to divide procurements

Based on:

- **Professions and trades** → simple but problems in timing because many trades work throughout the project
- **Location, space** (together with trades) → smaller procurements but better timing and more small suppliers
- **Completion of design** (e.g. fixed part and variable inner part) → better information from end-users
- Small procurements improve competition but decrease quality as integration and coordination become difficult
- Integrated procurement of design and delivery: **product parts, modules, turnkey solutions, systems...**

# Work breakdown structure (WBS)

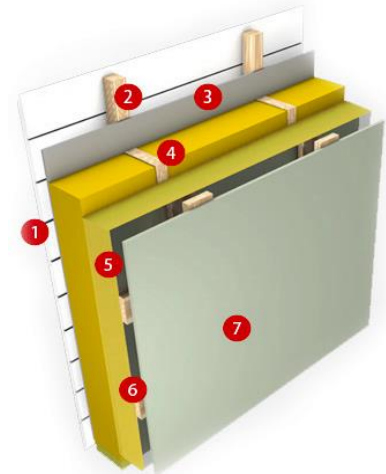
- Which tasks or parts can be designed and/or produced independently?
- How each task or part is related to each other; technically, functionally, timely, based on costs, responsibilities?



# Traditional vs. modular way to work breakdown in construction

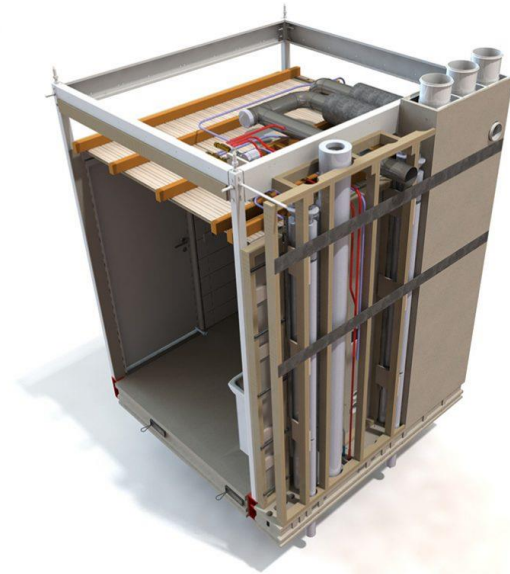
## Traditional breakdown based on trades and building works:

- Structural work – company A; Insulation – company B; Plasterboards – company C; Filling and painting – company D; Brickwork – company E; Plastering – company F; Electrical work – company G...
- Plenty of prerequisites, critical pathways, coordination, on-site work, integrated and inflexible products...



## Modular breakdown structure:

- Standard modules and elements which include several systems and functions
- Standardized but loose coupling between modules
- Modules are designed and produced by a single provider
- Less coordination, more prefabrication, less project specific design, strategy should be determined in early phase of the project...

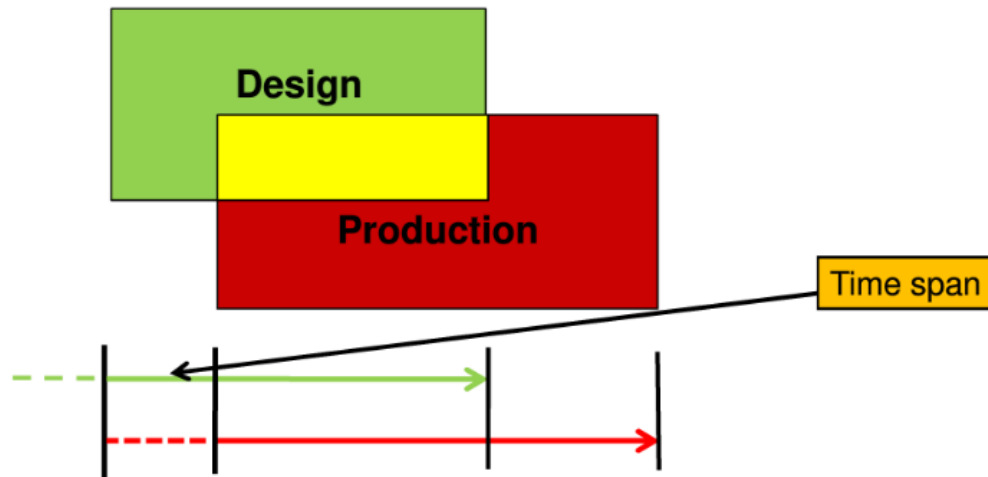


# Challenge of procurement between detailed design and production

## The scheduling system

In "Turn Key Projects" parallel design and production is part of the concept.

This is challenging because of the little time span between design and production





# Typical timing of procurement tasks in the project lifecycle

## 1. General Contractor's cost estimation for customer's bidding process



- Preparation of the initial procurement plan
  - Advance bids from critical suppliers
  - First cost estimations

## 2. Preparation phase after contract with the customer



- Partition of the procurements into packages and items
  - Definition of contract program
  - Detailed cost estimations

## 3. Detailed design management phase



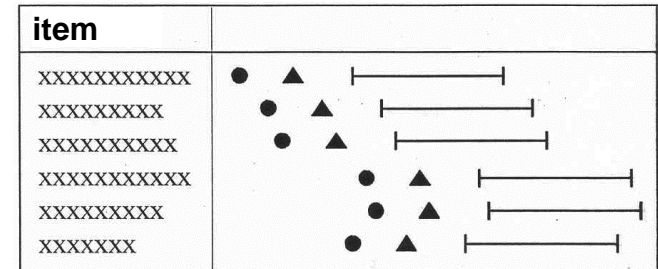
- Specifying procurement packages
  - Schedules
  - Targets
  - Connection to design packages
  - Responsibilities
- Start of bidding processes

Construction phase

# Timing of individual procurements

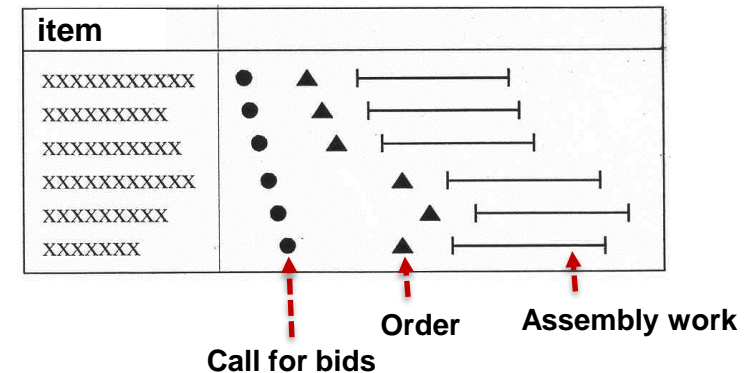
## 1. Traditional method – backward timing

- Procurements as late as possible
- Scheduling backward from assembly work



## 2. Alternative method – forward timing

- Preparations and call for bids as early as possible
- Order just-in-time
- Enough time needs to be reserved for a) **bidding process**, and b) **detailed design before bidding**



# From plan to call for bids and contract

## Plan of the sub-contract

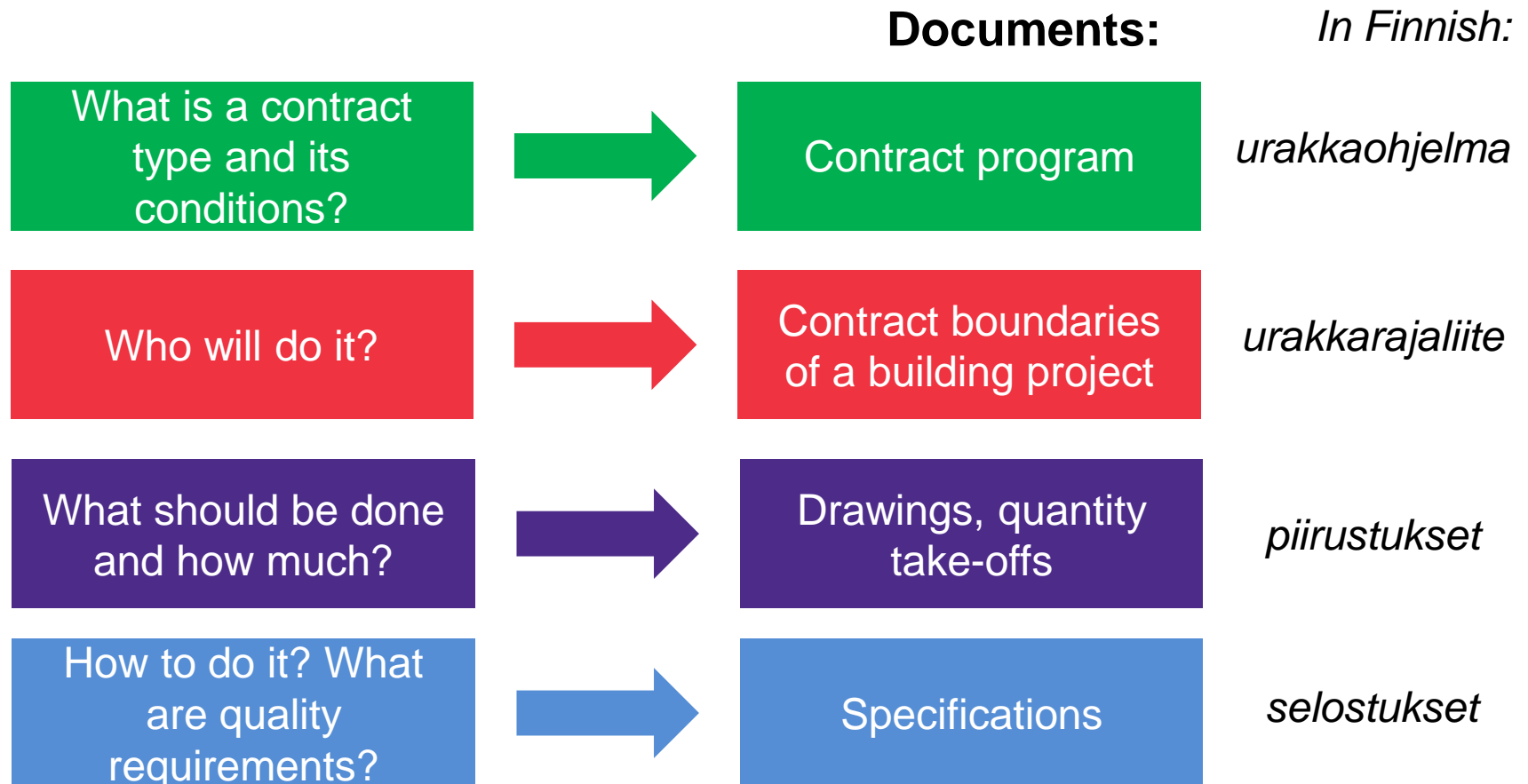
- Content, methods, equipment
- Analysis of the potential problems
- Cost target
- Timing
- Quality requirements and quality assurance tasks



## Call for bids and contract

- Demand for performance
- Contract boundaries
- Comparison of bids
- Contract and unit prices
- Schedule of the sub-contract (start, completion, milestones, speed of production, resource information)
- Quality requirements and values, quality assurance tasks, documents

# Documents of call for bids



# An example of a detailed contract boundary document

## Painting works (painting included in general contractor's works)

|  |    |   |   |   |    |  |  |
|--|----|---|---|---|----|--|--|
| ▪ Each contractor purifies and primes the untreated fasteners and brackets of his/her contract                         |    | P | A | E | AU |  |  |
| ▪ Radiators with brackets and heat pins brackets are removed once for a job during the wall painting and leveling work |    | P |   |   |    |  |  |
| ▪ The costs of the second removal are the responsibility of the main contractor  | GC |   |   |   |    |  |  |
| ▪ All instruments, radios and equipment are delivered pre-painted  |    | P | A |   | AU |  |  |
| ▪ Instruments and equipment are immediately marked after finishing the paintwork                                       |    | P | A | E | AU |  |  |
| ▪ All paintings of visible steel and copper pipes in accordance with the painting proposal                             | CG |   |   |   |    |  |  |

# Supplier selection process

- **Supplier selection is typically made based on**
  - Comparison of bids (open or limited process)
  - Negotiations
  - Design competition (e.g. public buildings)
  - Other information (experience, feedback, credit ratings...)

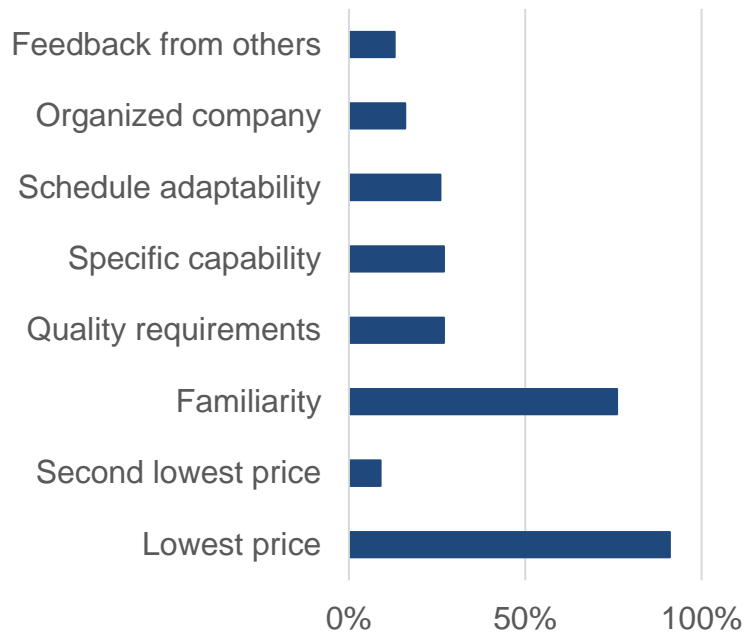
**... or mix of those**

# Selection criteria

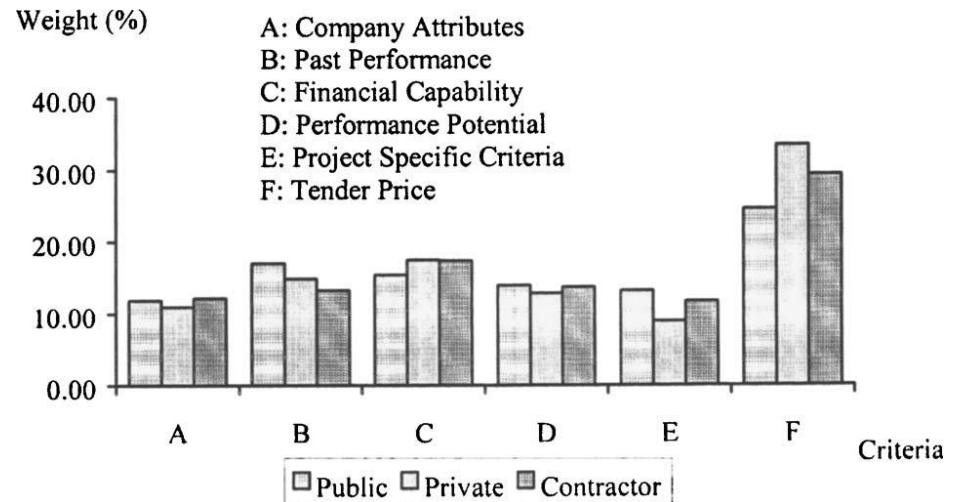
- **Public procurements**
  - Total economic affordability (can be almost anything!)
  - Lowest price
  - Innovativeness
- **Other procurements**
  - Price
  - Quality
  - Technical capacity (size, personnel, references, equipment...)
  - Economic capacity (credit ratings, taxes, insurances, collaterals...)
  - Schedule applicability
  - Experience & feedback from others

# Selection criteria preferences

## Criteria for selection



Source: Tuomas Särkilahti (1996)



Source: D. Singh and R. Tiong (2006) Contractor Selection Criteria: Investigation of Opinions of Singapore Construction Practitioners, J. Constr. Eng. Manage., 2006, 132(9): 998-1008.



# Check-point: Which of the following statements is not correct?

- **Statements:**
  - A. Trade-based division of procurement may lead problems in timing because many trades work throughout the project**
  - B. Modular breakdown structure enables using standardized elements which include several systems and functions**
  - C. In backward timing, preparations and calls for bids are made as early as possible**
  - D. Specifications define how the procured work has to be done**



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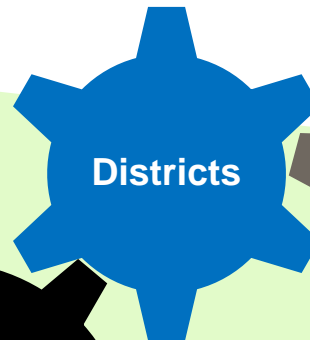
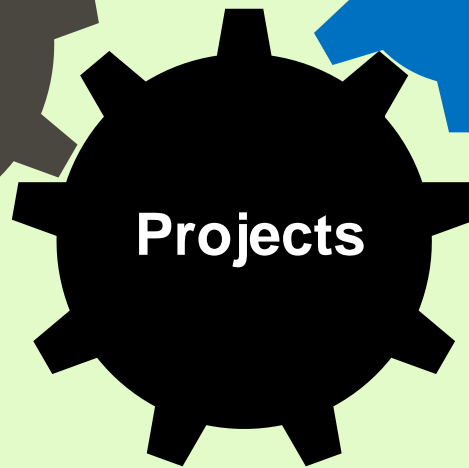
# From procurement to supplier management and development

# Supplier evaluation and development: Role of suppliers

- Call-offs
- Performance evaluation
- Project purchases
- Feedback

- Requirements and needs
- Purchasing plans

- Targets and demands
- Common way of working
- Sourcing strategies



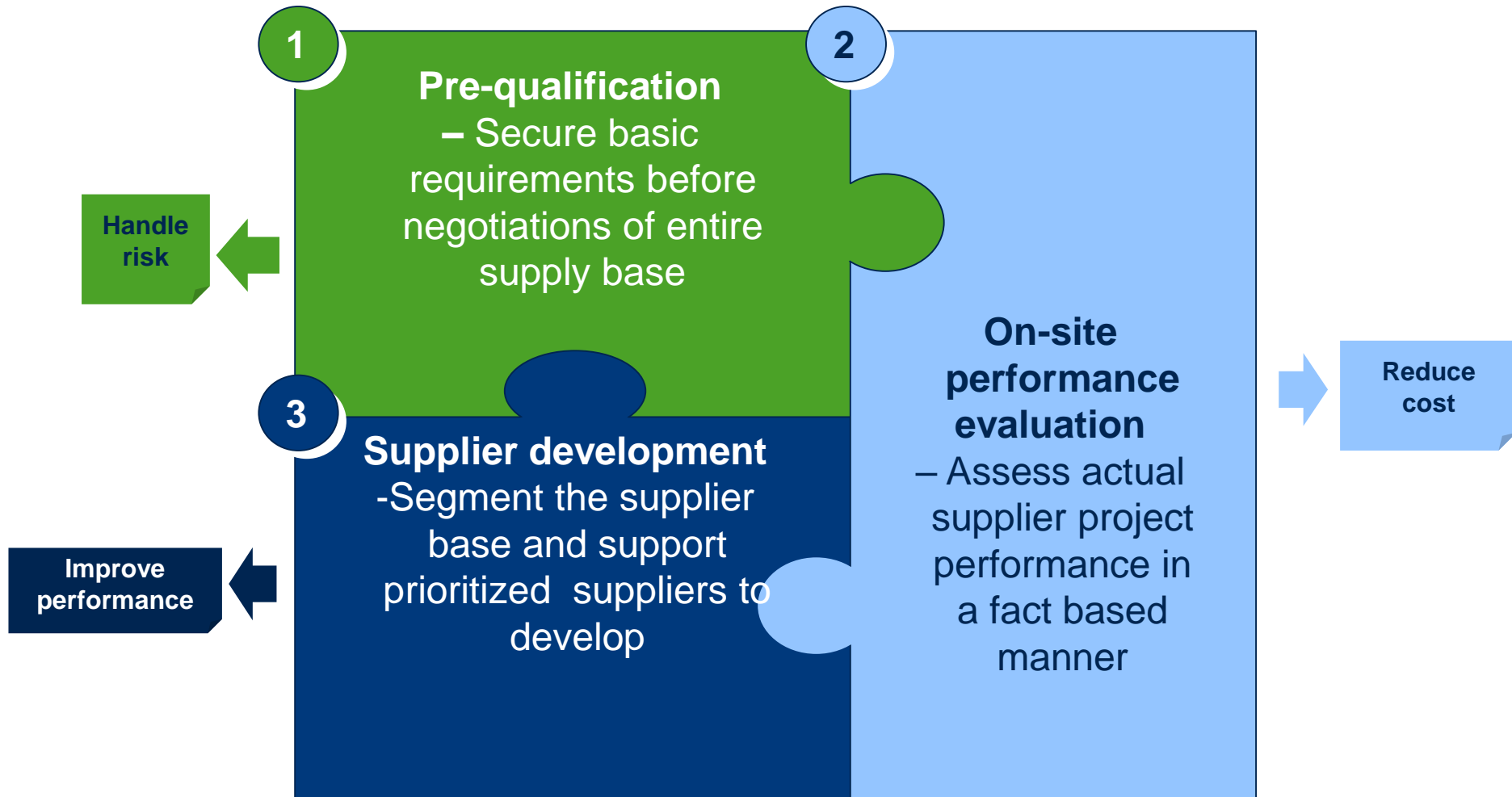
- Site teams
- Project purchasers

- Local mgt teams
- Purchasers

- BU Head of procurement
- Category teams and analysts
- BU steering groups

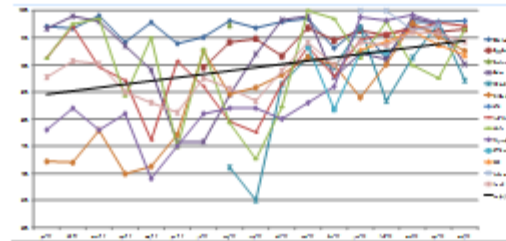
- Nordic Sourcing
- Supplier Mgt
- Competence Mgt
- Sourcing Board
- NBUP

# Supplier Management - Preferred supplier program



In 2012 the # of pre-q was 959 (SWE/FIN) and 2013 the result was > 2300 number of prequalification's on a Nordic level- improvement in less red suppliers

## Supplier development | Establish a new way of working with suppliers



- Today, 40 framework agreement suppliers
- Expected number end of the year: > 60 suppliers
- Average delivery precision September ~95 %

### Status in Sweden

Baseline

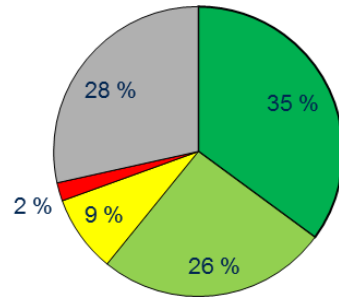
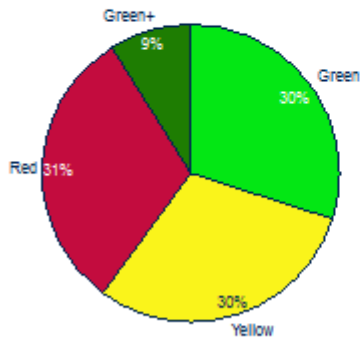
After 1 year

+12%

18

Pre-Qualification 2012

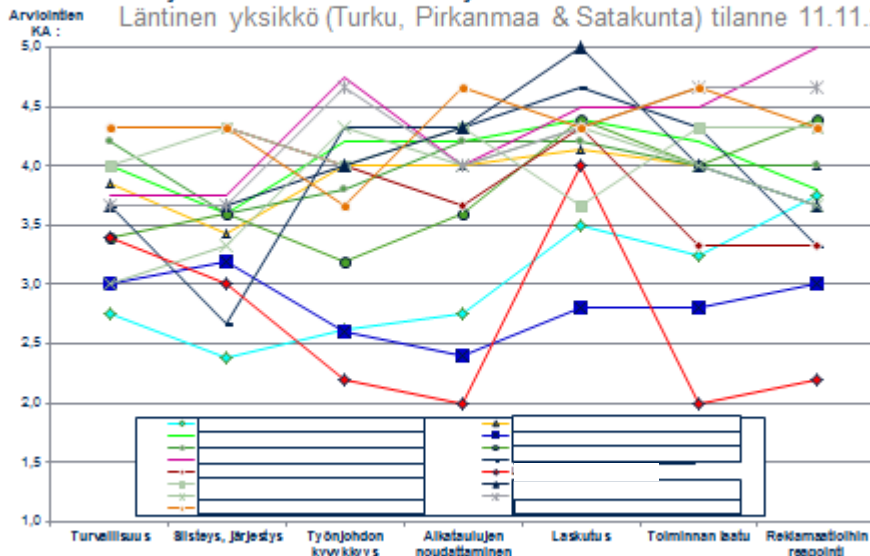
Pre-Qualification 2014/2



- Grön+
- Grön
- Gul
- Röd
- Ej förkvalificerad

### Projekti-kohtaiset toimittajat

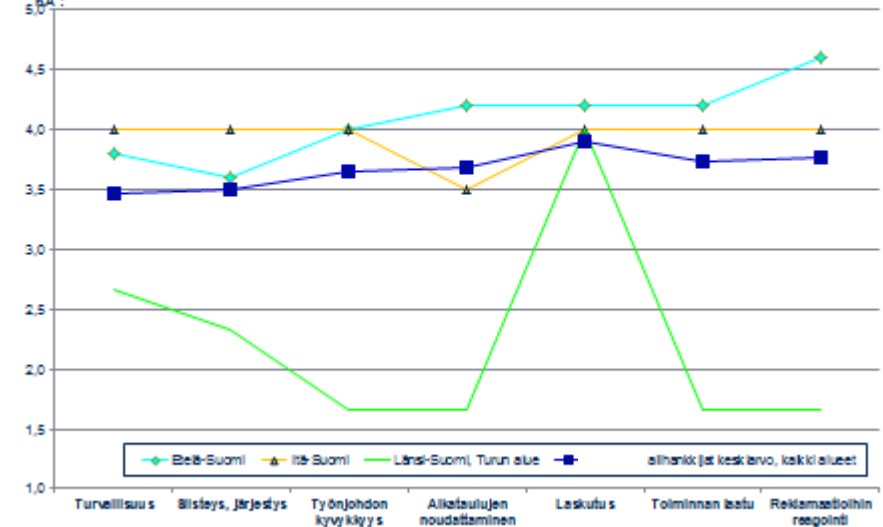
Läntinen yksikkö (Turku, Pirkanmaa & Satakunta) tilanne 11.11.2013



### Company A

suorituminen alueittain

Tilanne 11.11.2013



# Contracts in construction

# Engineering approach to contracts

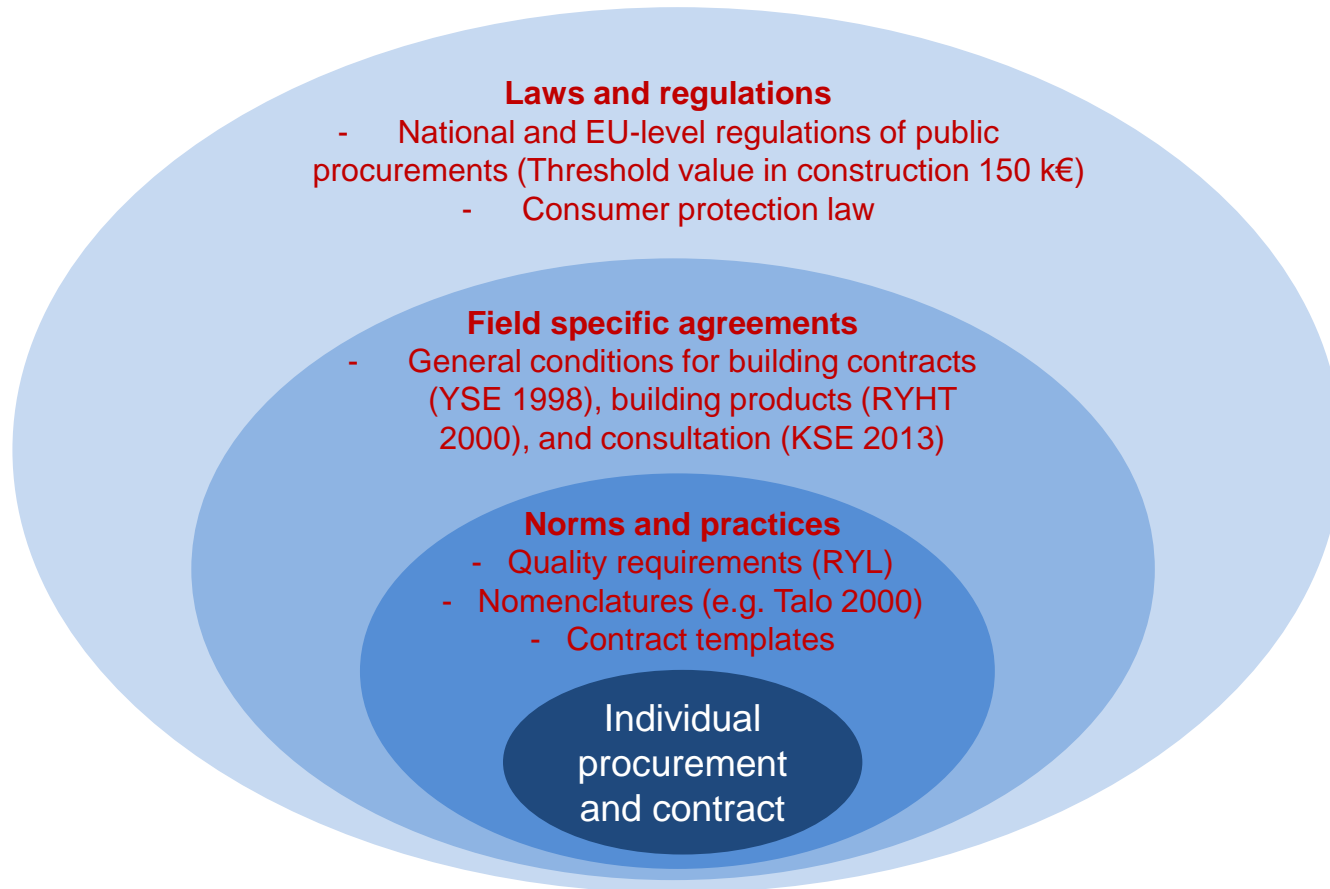
- **How to manage with contracts?**
- **How contract can support project delivery and value?**
- **How to avoid disagreements?**
- **How to interpret contracts?**

# What is a contract?

- **Contract as an expression of intent**
  - Tender → response
- **Provides predictability into cooperation between parties**
- **Parties' responsibilities defined by the conditions of the contract**
- **Contract is not same as contract document!**
  - Responsibilities can be based also e.g. on given spoken information



# System environment of procurements and contracts





# General conditions for building contracts (YSE 1998)

- **Developed in the industry; balance between parties**
- **Shape practices in the industry (good and bad!)**
- **Increase time and resource efficiency as many parts of the contract are ready**
  - Reference to YSE
- **Understanding interpretation practices is needed to avoid conflicts**
  
- **DANGER: Don't trust too much on a ready paper!**

# Content of YSE 1998 - I

- **Contractor's obligations to render services**
  - Principal and further obligations, site services, site management duties
- **Work progress and cooperation**
  - Schedule, site arrangements, co-operation, **client's obligation to collaborate**
- **Quality assurance**
  - Client's quality assurance, contractor's quality assurance, contractor's quality control
- **Contract documents**
  - **Order of validity of contract documents**, observing good building practice
- **Period of building contract**
  - Completion time, penalty delay, **legitimate grounds for extending contract period** (client's obligations, force majeure, calculating the extension, limiting delay, procedure to negotiate)
- **Contractor's liabilities**
  - Liability for defects in the finished result, product liability, liability during and after guarantee period, **contractor's obligation to notify**
- **Client's liabilities**
  - Obligation to collaborate, liability for delay caused by client

# Content of YSE 1998 - II

- **Surety and insurance**
  - **Obligation to pay**
    - Payment of contract price, penalty interest, withholding
  - **Plan modification and price changes**
    - Obligation to carry out modifications, **effect of plan modification on contract price and period, additional work**, cost price, effect of index
  - **Title/ownership and risk of damages**
  - **Organization**
    - **Management** (mgmt by contractor, health and safety), **supervision** (client representatives, supervisors), effect of supervision on liability
  - **Joint meetings and proceedings**
    - Reviews, site meetings, measurements, inspections (also required by law)
  - **Handover**
    - Work completion inspection, handover inspection of building, settlement of accounts, guarantee inspection
  - **Record keeping**
  - **Termination and transfer of contract**
  - **Disagreements and their resolution**
    - Disputed work, right to correct contractor's neglect, resolving disputes
-

# Summary of the contracts

- **Every country has its own system environment**
- **Role of laws, agreements, norms and practices**
  - Public procurement
  - In Finland, KSE to guidance designers contracts, YSE for contractors
- **Modified contract forms used in collaborative delivery methods**
  - New YSE for Alliance projects

# Summary of the lecture

**“Describe role and tasks of procurement and contracts in construction”**

- **Procurements in construction**
  - Role of procurements
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  - Relationship between delivery method and procurements
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- **Contracts in construction**
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  - Content of contracts