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What would I wanted to know?

Investment implementation phase - Project Controls: Scope, Time and Cost Management

Agenda

I. Introductions
II. Scope Management
III. Time Schedule Management
IV. Cost Management

Pekka Tuisku

I. Work Experience

- Master Thesis for Pöyry, Spring/2018
- Project Engineer at PIDFI/IBG project controls team, Pöyry/AFRY 2018-2021
  - *Cost estimation*
  - *Scheduling*
  - *Cost/Schedule Controlling*
  - *(procurement)*
- Section Manager at PIDFI, Cost Management Team, AFRY 2021-

II. Education

- B. Sc/M. Sc, Industrial Engineering & Management, Tampere University of Technology, 2014-2018

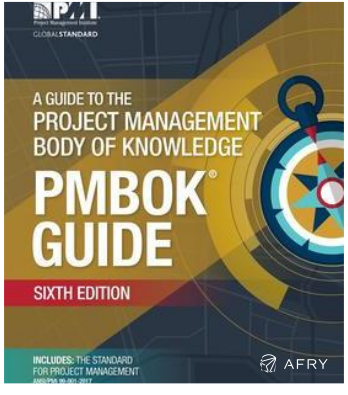
Learning Objectives

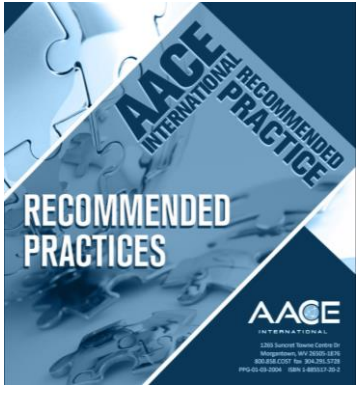
I. To understand that it all depends of the Scope
II. To understand the principles related to dynamic scheduling/control with Microsoft Project
III. To understand the importance of Cost estimation and control in projects
IV. To understand the key aspects of human resource estimates in the sales phase of the project
V. To understand the importance of communication, soft skills and “flipping the script” (if time, for information)

Definitions and Resources

I. **Please read the PMBOK and the construction extension as it is usually the basis of company specific project management guidelines and processes!**

II. AACE International's **Recommended Practice**





Project Scope Management?

"Project Scope Management includes the processes required to ensure that the project includes **all the work** required, and **only the work** required, to complete project successfully." – PMI

"**Product scope.** The features and functions that characterize a product, service, or result" – PMI

-> Scope of Supply

"**Project scope.** The work that needs to be accomplished to deliver a product, service, or result." – PMI

-> Activities needed to deliver the Scope of Supply

Project Scope Management Processes

I. **Collect requirements**

II. **Define Scope**

III. **Create Work Breakdown Structure (WBS)**

   i. "Create WBS is the process of subdividing project deliverables and project work into smaller, more manageable components." – PMI

IV. **Define activities**

   i. "Define Activities is the process of identifying the specific actions to be performed to produce the project deliverables." – PMI

V. **Verify Scope**

VI. **Control Scope**

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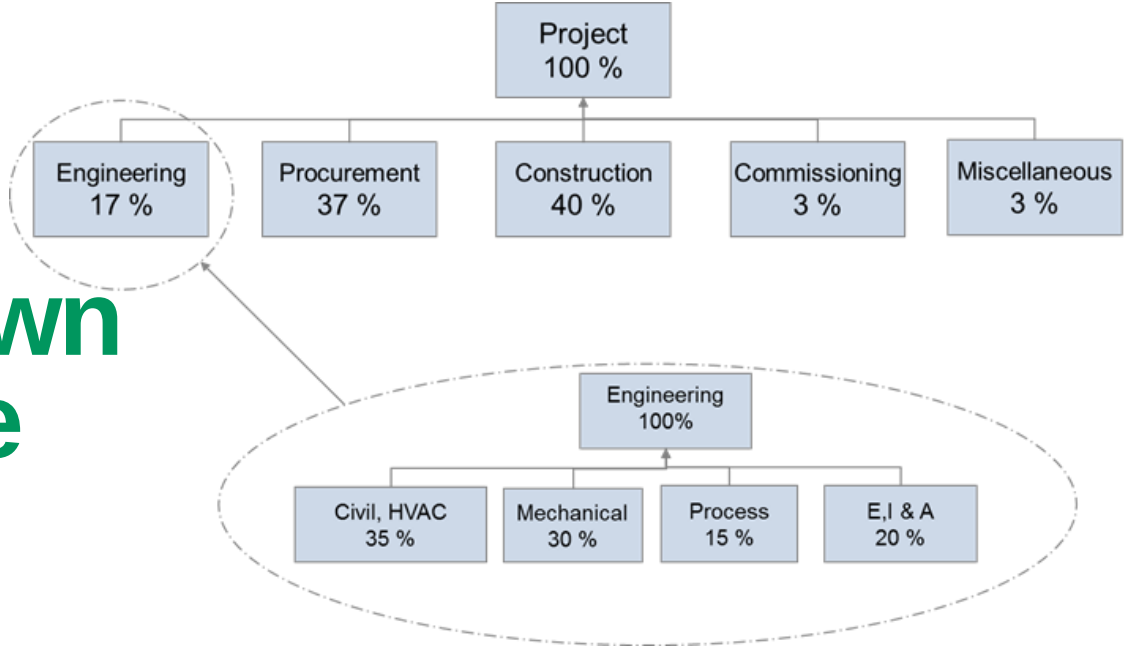
Work breakdown structure



Time Schedule Management

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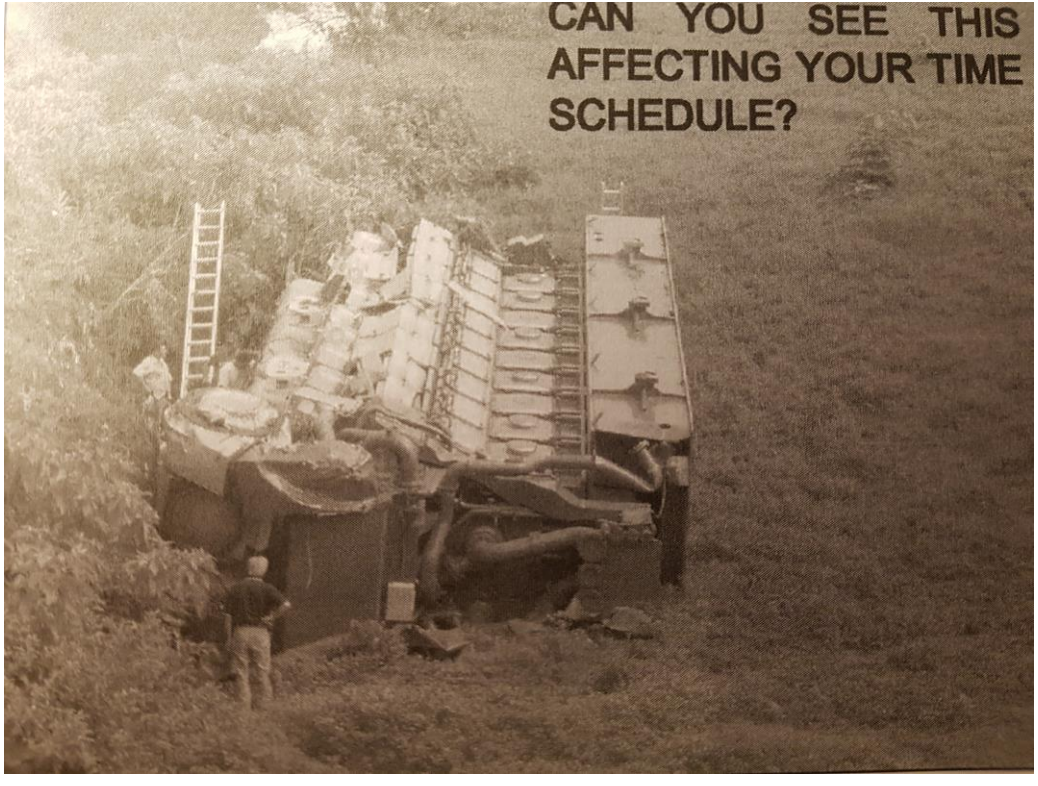
Why scheduling? Is it important?

Quick quiz:

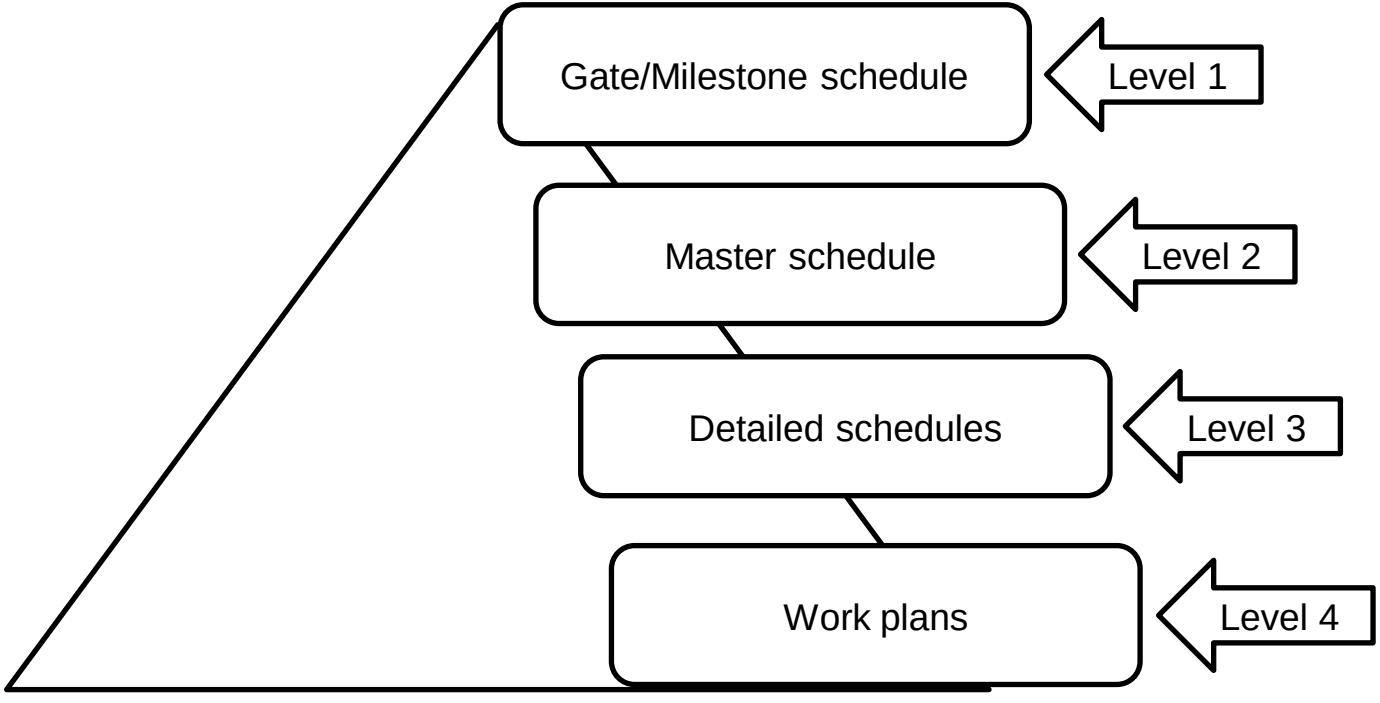
- *Form a three person groups and discuss for 5 minutes why time schedules are important.*
- *Make notes and prepare to share two most important findings with the class.*



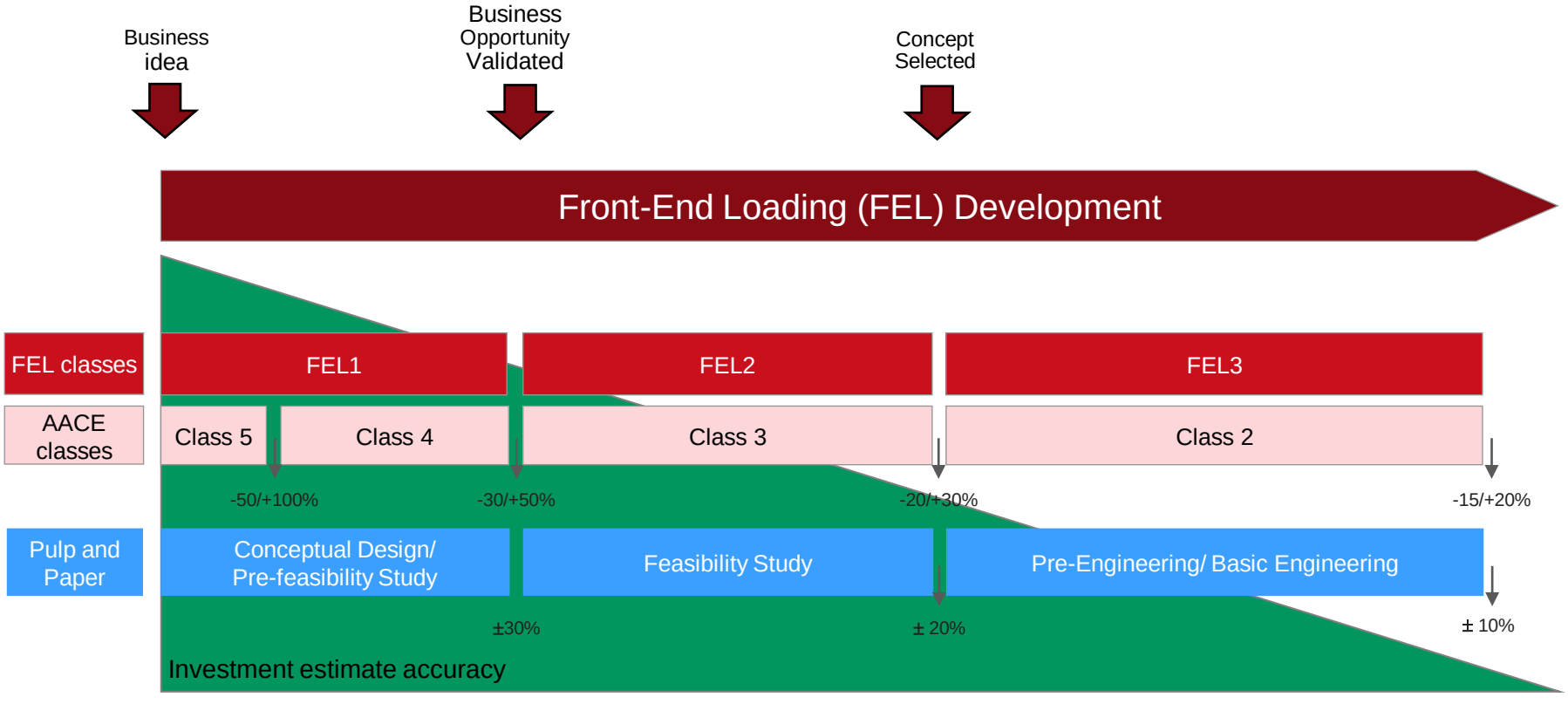
Time Schedule Basics

- Time schedule is a tool to manage the project, not only for reporting
- Dynamic, complete and detailed schedule makes it easier to control the project
- Focus on the remaining work

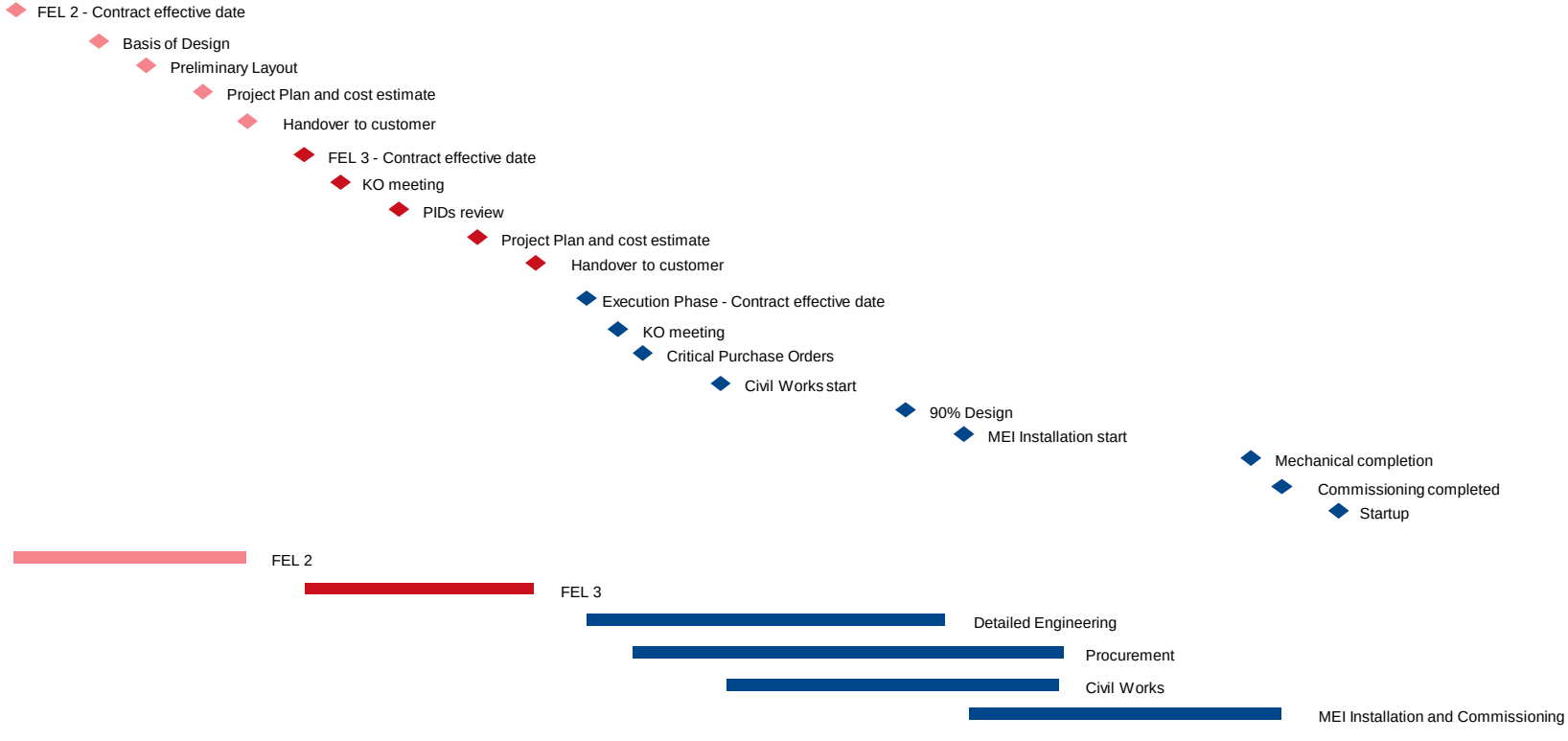
Schedule Hierarchy



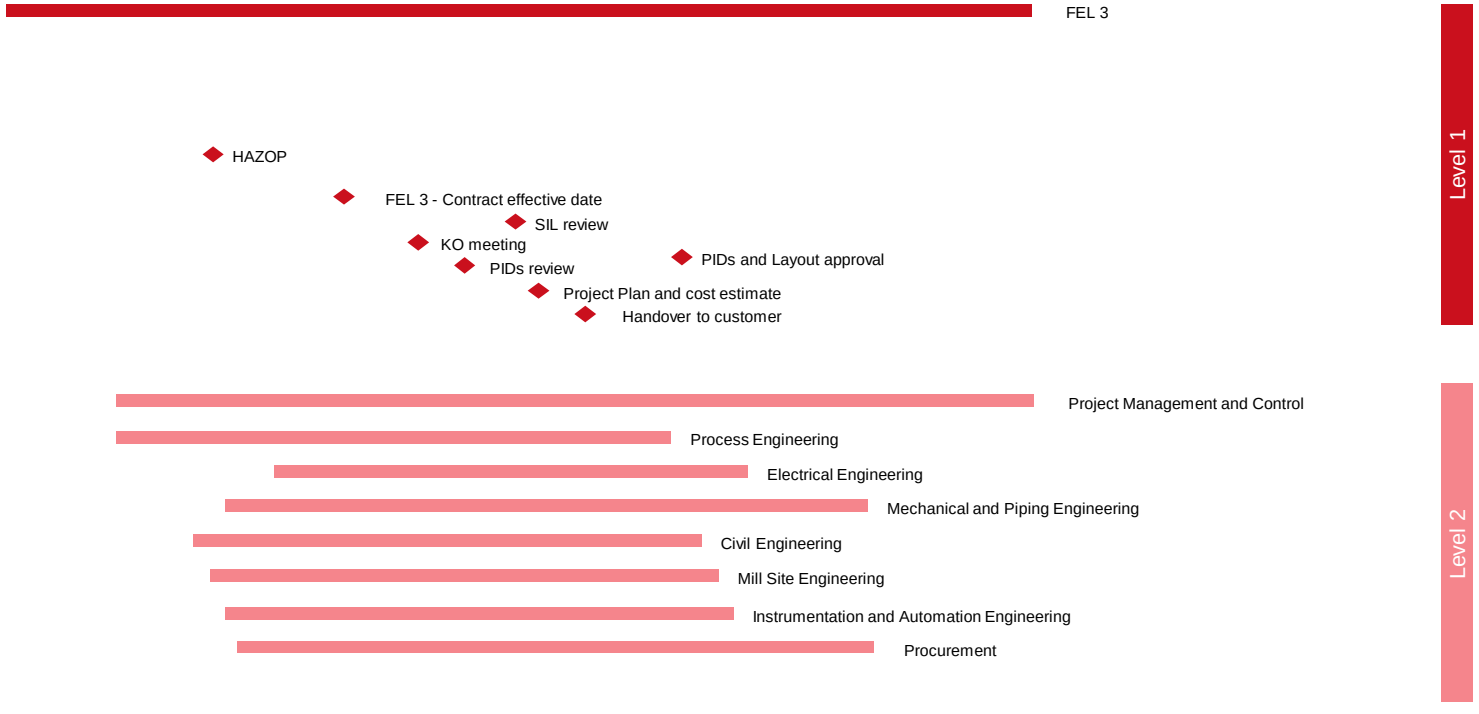
Project life cycle



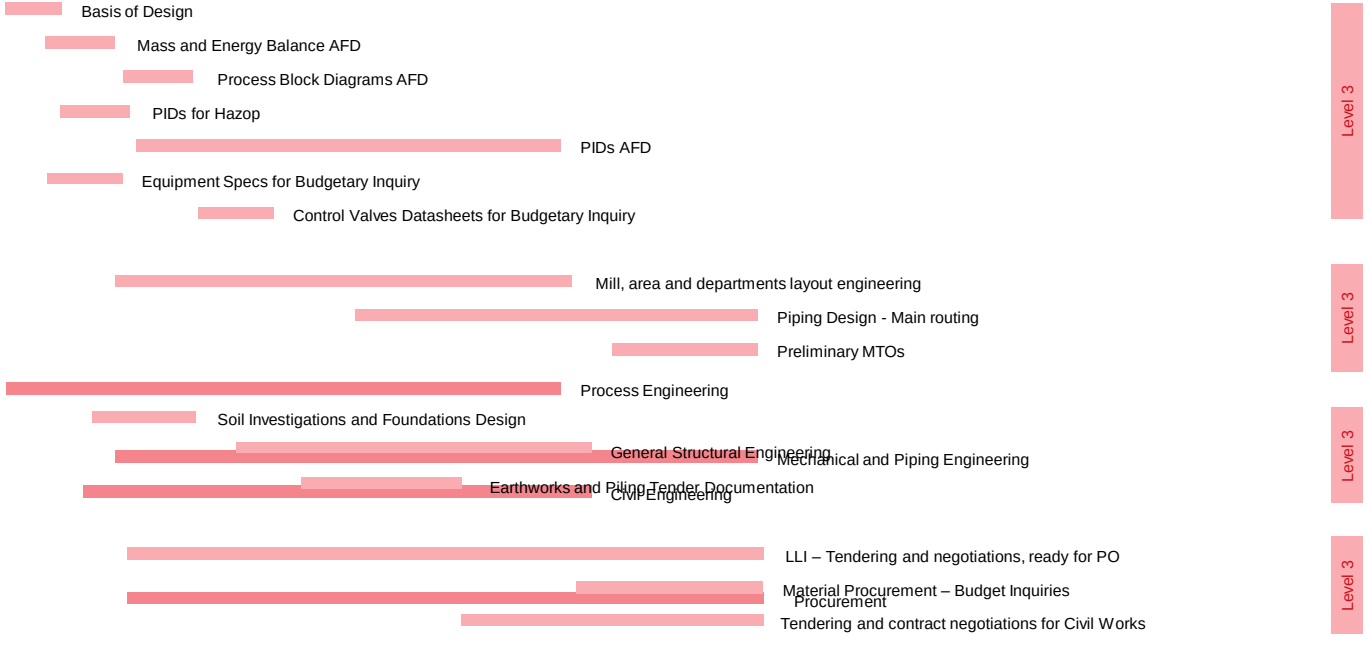
Level 1 schedule – Overall Project Lifecycle



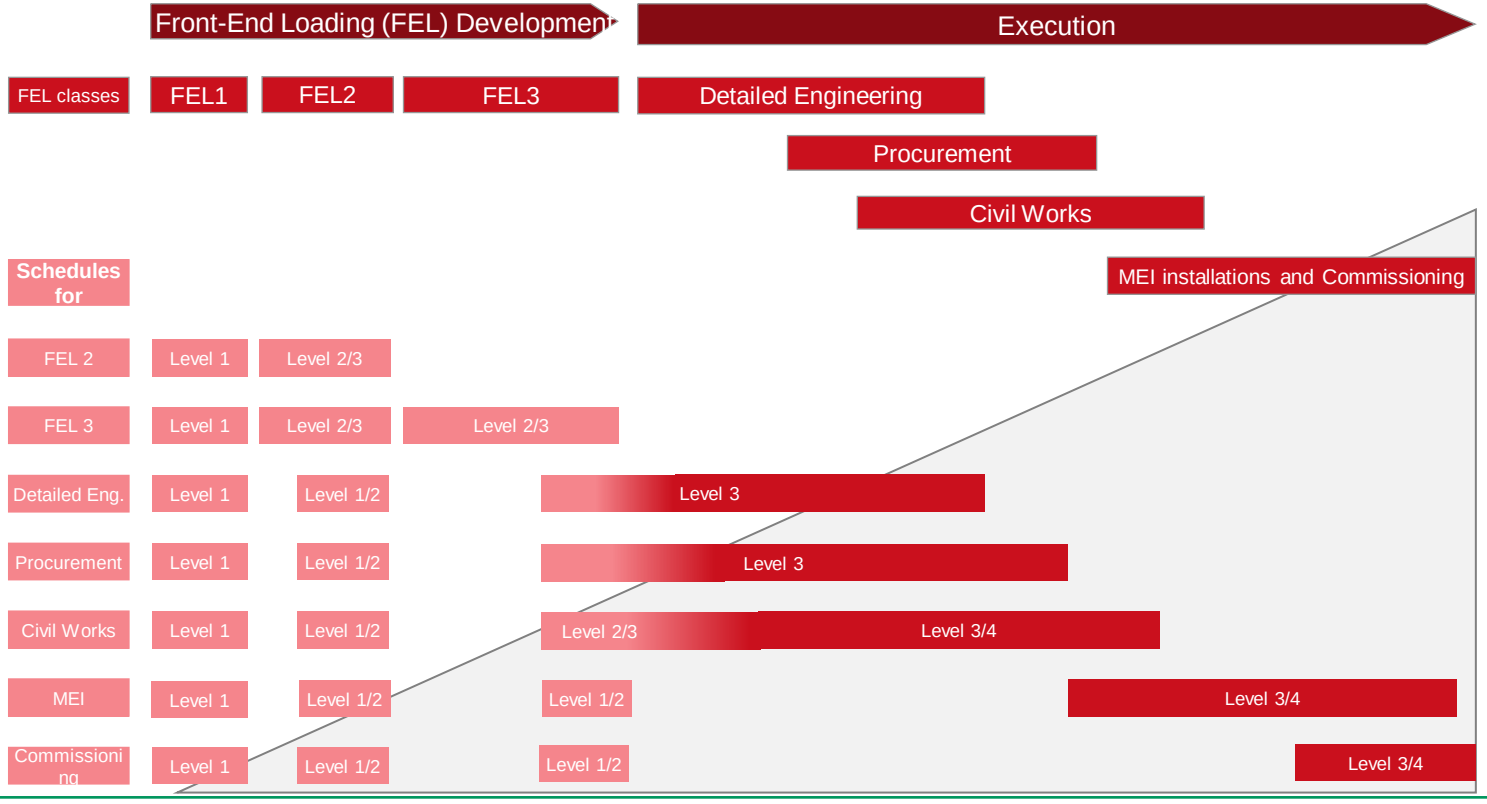
Level 2 schedule – Basic Engineering



Level 3 schedule – FEL 3



Project Lifecycle and Schedule Levels



Schedule Definitions 1/2

Proposal time schedule

- Is prepared as part of the proposal package
- Defines the tasks to be executed during the project (a rough time schedule possibly with hidden dates)

Target time schedule for the whole project

- Is prepared typically as one deliverable of FEL1 and FEL2
- One page time schedule defining the time frame for the entire project including important project milestones, engineering, procurement and construction phases.

Master / area time schedule

- Defines engineering, procurement and construction phases in details for each process area.

Engineering time schedule

- Defines all the deliverables that are included in the scope and timelines for each deliverable. Schedule should be resource loaded with budgeted hours to make the progress follow-up and reporting more precise

Procurement time schedule

- Describes the work flow for engineering as well as procurement activities in the procurement process. Engineering is producing the enquiry specifications but is also dependent on the initial data from purchases/machine suppliers.

Schedule Definitions 2/2

Construction and Installation time schedule

- Time schedule for construction phase including all the civil tasks as well as installation activities. It should be logically linked to be able to follow the work flow at construction site. Could be done also with excel when the amount of details/activities are on hourly level.
- Installation time schedule which includes time schedules from each machine supplier and each contractor.
- The planner is coordinating all interfaces between suppliers.

Commissioning and start-up time schedules

- Detailed schedule for commissioning activities including all water run/commissioning groups defined with equipment, motors, I/O loops etc.

Document delivery schedules

- Is prepared during detailed engineering phase and usually part of the RFQs
- Schedule to be included in machine/equipment supplier's contracts defining delivery dates for documents needed as an initial data for engineering. Usually dates are defined as C+weeks (C=contract date) and format for the document can be excel or word.

Contract control schedules

- Is typically prepared during detailed engineering and is part of the RFQs.
- Schedule to be included in machine supplier's contracts and other contractors defining the dates for delivery, installation start and finish, commissioning dates, take-over and guarantee period. Format for the document can be excel or word.

Scheduling Process

i. **Activity definition**
   - Scope (contract), PM maturity, organizational process capabilities, work breakdown structure

ii. **Activity sequencing**
   - Identify and document relationships between activities (all dependencies, no open ends)

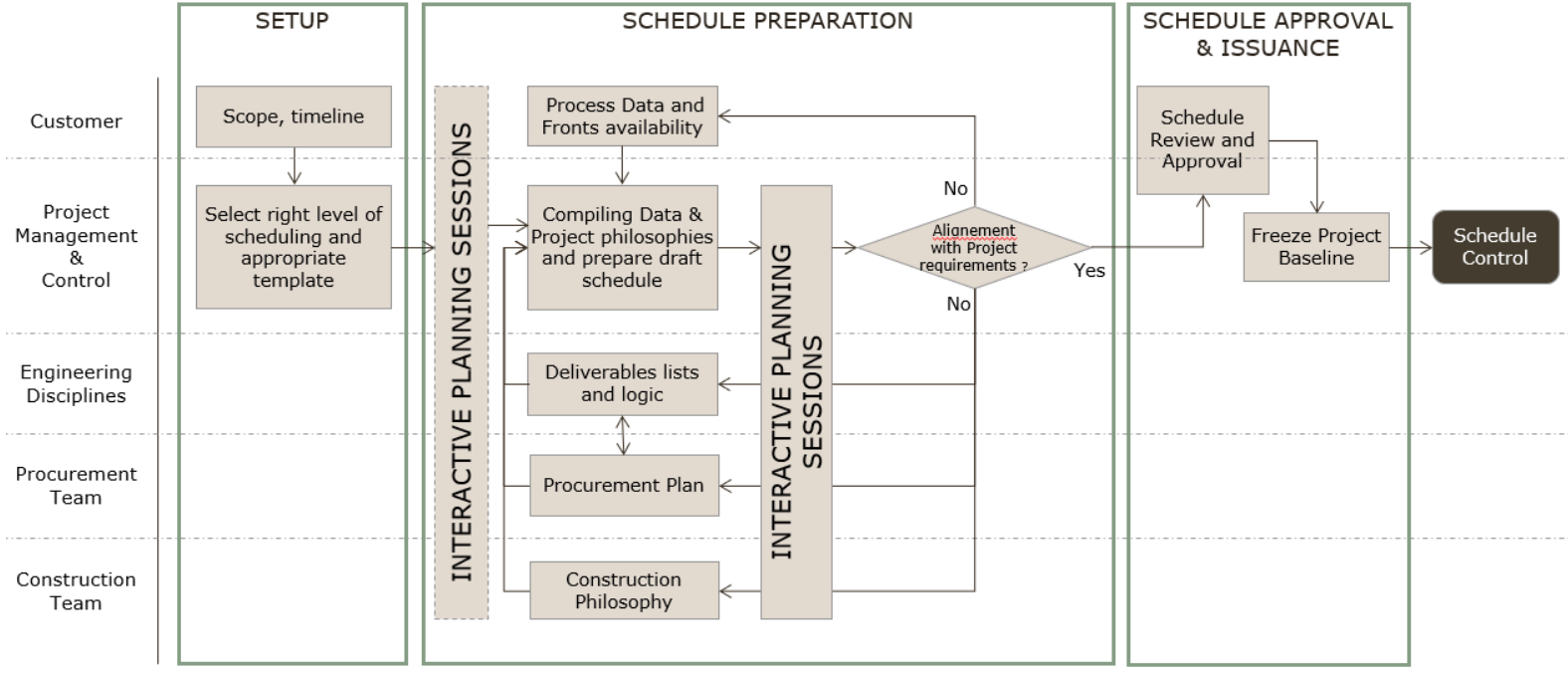
iii. **Activity resource estimation**
   - Type and quantities of material, people, equipment, etc. to perform the activity

iv. **Activity duration estimation**
   - Duration x Units = Work (not applicable for all tasks e.g. shipments)

v. **Schedule development**
   - Analyze activity sequences, durations, resource requirements and constraints to create the project schedule

vi. **Schedule control**
   - Measure project progress to update the schedule and manage changes to the baseline

Schedule Development - Process



Dynamic Scheduling and Control with Microsoft Project

Dynamic scheduling means the following:

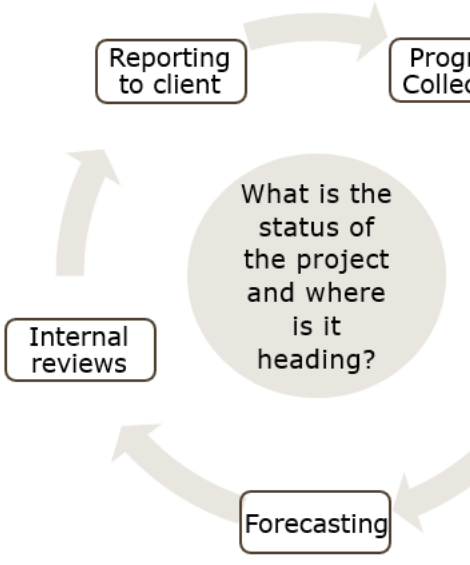
i. **Only one task does not have a predecessor (task that starts the project)**

ii. **Only one task does not have a successor (task that ends the project)**

iii. **Links or dependencies should be carefully selected so that you don't break the dynamism**

Dynamic scheduling should be one thing that separates Microsoft Excel "schedules" from Microsoft Project "schedules"

Schedule Control - Process



Reports typically include:

- Summary Follow-up Schedules (Planned vs Actual Progress)
- Summary S-curves & Histograms
- Project Highlights & Concerns

AFRY is normally using standard S-curves report templates.

The input consists of:

- Engineering progress from lead engineer
- Construction progress from construction management (input from contractors)
- Procurement services progress from procurement team
- Vendor progress from Expediting team

During reviews:

- Project planner challenges discipline leads on forecasted dates and estimated duration based on productivity and benchmarking
- Notify Project Management & all project team of possible delays and schedule risks!!

Progress data updated into the master schedule:

- Physical progress
- Actual start & finish dates
- Estimated start and finish dates and/or remaining duration

While working on forecast:

- Focus on the activities on the critical path
- Use earned value principles (manhours, quantities, costs)
- Remaining duration and/or forecast finish dates typically estimated by leads/vendors/contractors

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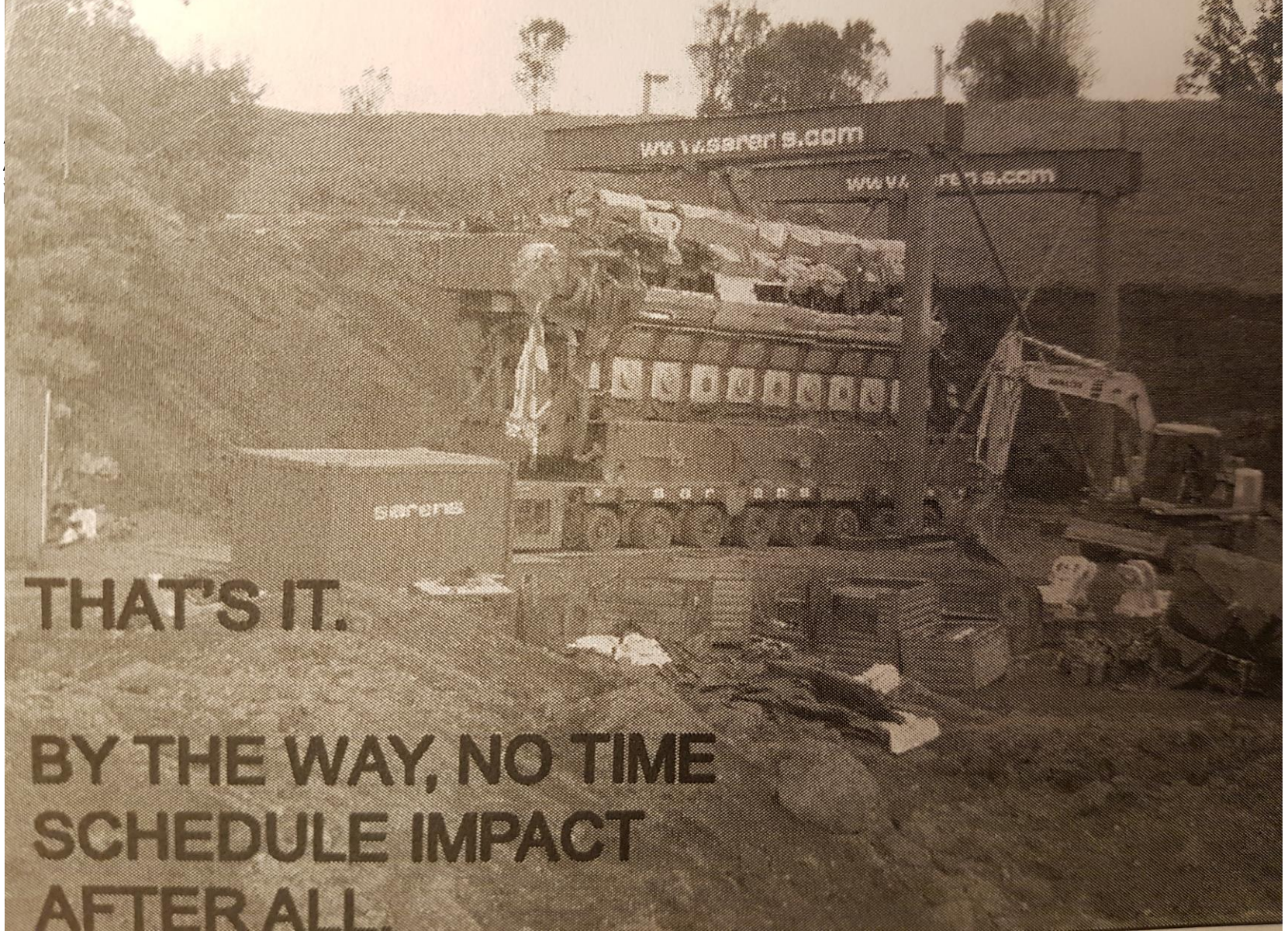
Case A

Gather to two or three person groups and discuss the potential implications of the failed Wärtsilä engine delivery to the project schedule?
(10 minutes)


THAT'S IT.
BY THE WAY, NO TIME
SCHEDULE IMPACT
AFTER ALL.

Cost Management

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Cost Management Basics

“Estimating, budgeting and controlling costs so that the project can be completed within the approved budget.” – PMI

I. **Estimating: In order to estimate costs you need scope, time schedule, resource plan, contingency information, cost information about each activity and**

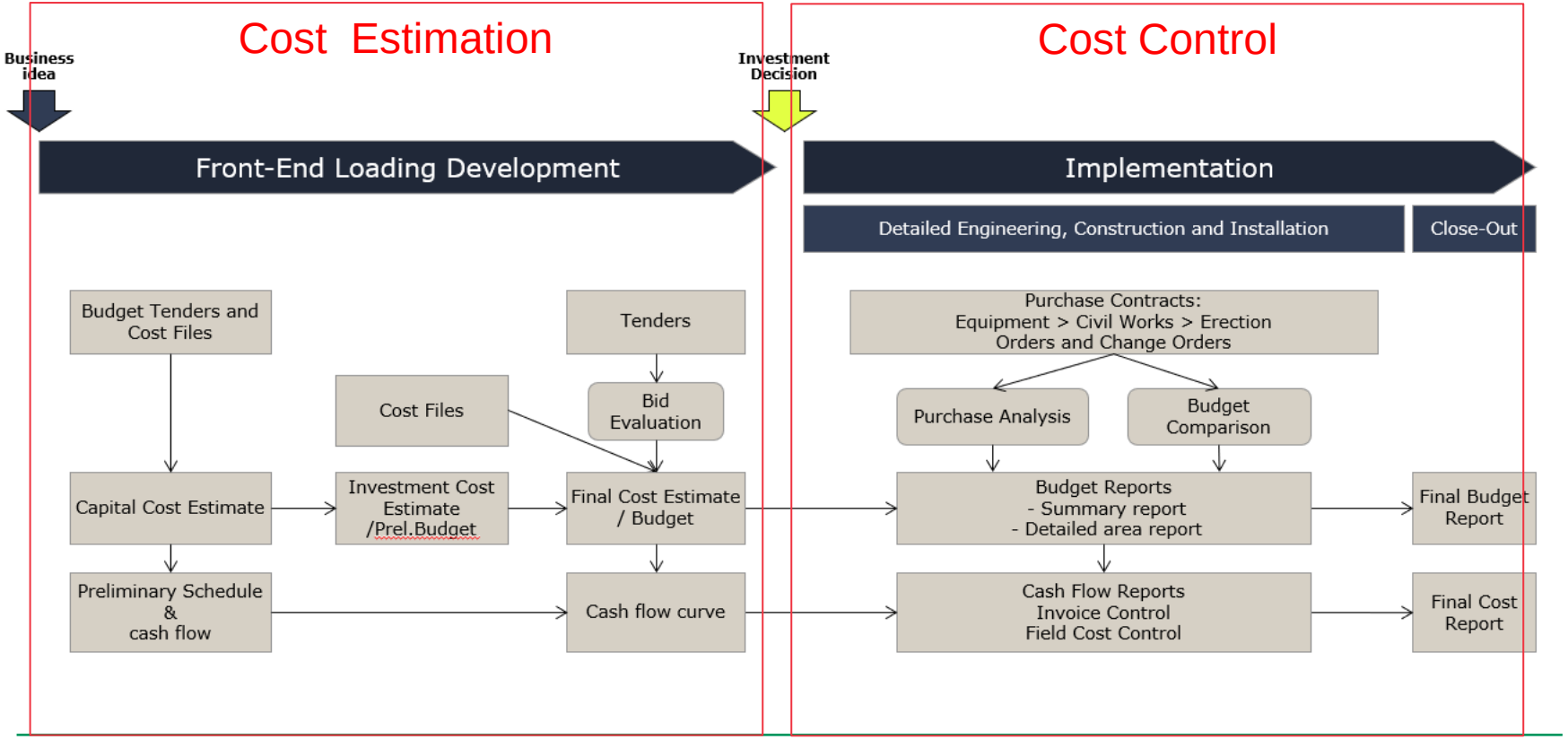
II. **Budgeting: Cost aggregation + expert judgement (technical experts, historical experience, etc.)**

III. **Cost control tools and techniques include: project team forecast compared to sales forecast, earned value management, performance reviews**

Importance of Project Financial Reports

- **Project Financial Reports form the basis of AFRY's business reporting and therefore business results!**
- **Better or more accurate Project Financial Reports will help management to tackle issues early and could also save costs e.g. lowering the need to borrow money**
- **Project cash flow forecast should be reviewed during the sales negotiations in order to verify that more cash is coming in as customer payments than what is going out as salaries and other operational costs**

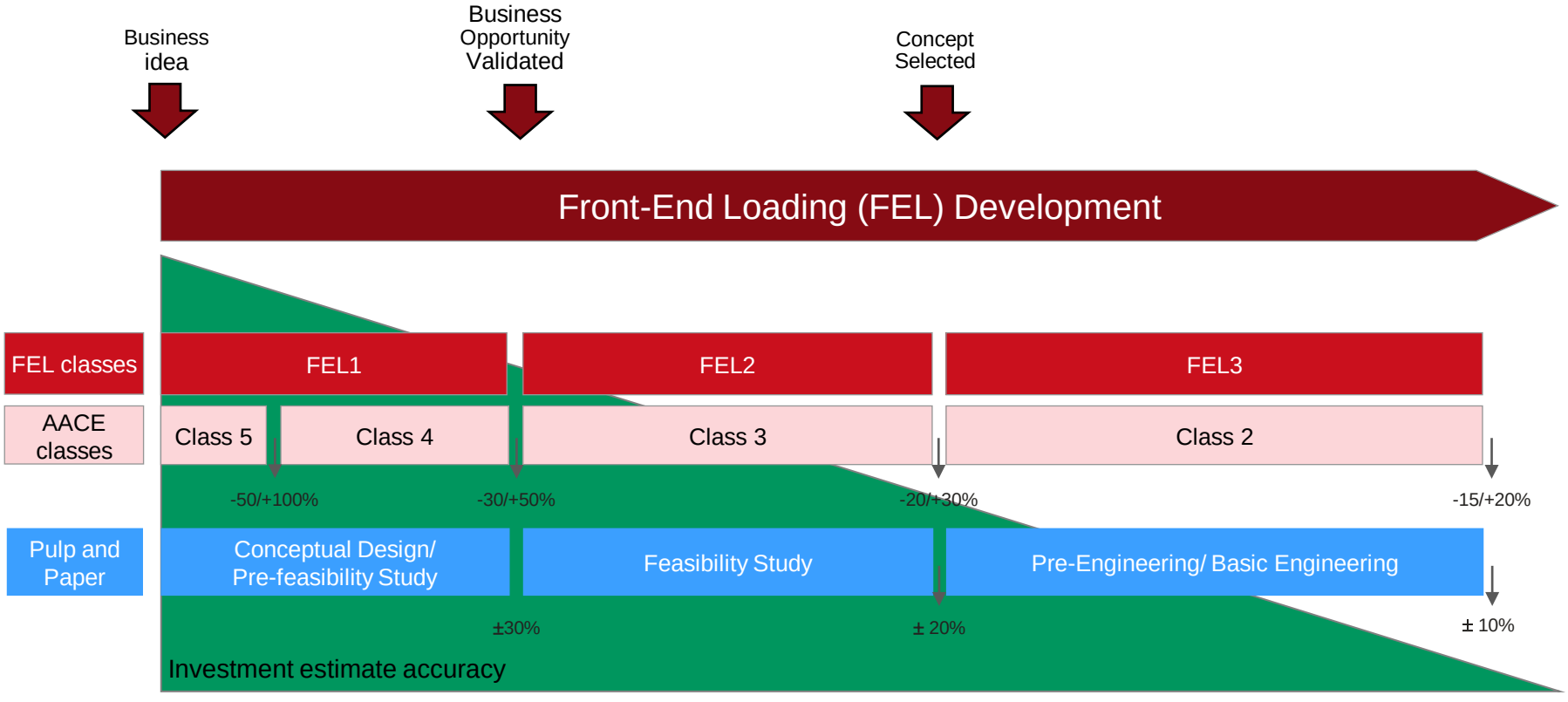
Cost Management vs project life cycle



Investment Cost Estimate

- **Investment cost estimate is one of the key deliverables what our customers require to have in many projects**
- **The customer wants to know the total investment cost of the project before committing to the investment**
- **Cost estimate accuracy expectations are based on the project phase.**

Investment cost accuray



CAPEX Estimation - Example

Client
Subheading

SUMMARY
- 1000 EUR -

Code	Area	0 Indirects	1 Civil Works	2 Machinery	3 Piping	4 Electrical	5 Process Control	6 HVAC	7 Spare Parts	0 to 7 Total
10	Alue 1									
15	Alue 2									
20	Alue 3									
90	Mill Site									
	DIRECT, TOTAL									
00	Indirect Costs									
01	Engineering									
02	Project Administration and Construction Management									
04	Temporary Facilities & Services									
	SUB-TOTAL									
	Contingencies, 20%									
	TOTAL									

Cost Control - Example

Cost Control – Challenges – Olympic stadium

”Olympiastadionin remontin loppulasku voi paisua vielä lähes 100 miljoonalla eurolla, ministeri pyytänyt ylimääräistä tilintarkastusta

Stadionin remontin kustannukset nousivat jo aiemmin alkuperäisestä 200:sta 261 miljoonaan, mutta loppulasku saattaa olla jopa 350 miljoonaa euroa. Elinkeinoministeri Mika Lintilä pitää edesvastuuttomana, jos valtio vain kuittaisi osaltaan laskuun ilman että kulujen alkuperää selvitettäisiin.”

Tero Hakola HS

19.12.2019 14:53 | Päivitetty 19.12.2019 19:01

Cost Control – Challenges - Länsimetro

”Selvitys kertoo, että kaupunkien tehdessä länsimetron rakentamispäätöksiä vuonna 2007 oli kustannusarviona hankkeelle 714 miljoonaa euroa. Arvio kustannuksista pohjautui vielä vähäiseen suunnitteluun, eikä lisä- ja muutostöihin oltu varauduttu.

Tänä päivänä maarakennuskustannusindeksin muutos huomioon ottaen alkuperäinen kustannusarvio olisi 848 miljoonaa euroa. Indeksin vaikutuksesta alkuperäinen kustannusarvio nousi siis 134 miljoonaa euroa.

Tämänhetkinen länsimetron kustannusarvio on paisunut 1,2 miljardiin euroon.

Indeksillä korjattu alkuperäinen länsimetron kustannusarvio tulee selvityksen mukaan luultavasti ylittymään lopulta noin 338 miljoonalla eurolla.

Tommi Kolehmainen HS

5.10.2017

https://yle.fi/uutiset/3-11627692 (2020)
https://yle.fi/uutiset/3-9866922 (2017)
https://www.lansimetro.fi/kustannukset/

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Case B

What reasons are there for budget overruns?
(Open discussion 10 minutes)

Uncertainty in cost estimating – Case C

- Inaccurate Project Estimates (Cost, Time, Resource)
- Design Errors
- Not Planning for Change Orders/Scope Challenges
- Poor Site Management (Quality, Labour, Progress)
- Administrative errors
- Project Uncertainties (Unplanned costs etc)
- Inexperience of estimator
- Poor data (tendering, cost data)

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AFRY
ÅF PÖYRY

Thank you!

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