Week 2

Introduction to Project Management

457.307 Construction Planning and Management

Department of Civil and Environmental Engineering
Seoul National University

Prof. Seokho Chi

shchi@snu.ac.kr

건설환경공학부 35동 304호

What is a Project? (PMBOK Chapter 1)

- **"A temporary endeavor undertaken to create a unique product, service, or result."** (PMBOK, pg. 5)
  - *Temporary* means that every project has a defined beginning and a defined end.
  - Projects involve doing something which has not been done before and which is, therefore, *unique*.
- **Examples?**
  - Developing a new product or service
  - Effecting a change in the structure, staffing, or style of an organization
  - Developing or acquiring a new or modified information system
  - Constructing a building or infrastructure
  - Implementing a new business process or procedure

What is a Project?

- **A project is**
  - Decided by people, materials, and equipment
  - Characterized by phases, multiple participants from different organizations, scheduling, cost constraints and creativity.
  - Very dynamic in nature and involves considerable coordination and communication.

What is Project Management?

- "A process that helps project teams coordinate their efforts so they may create the right product (or service, process, or plan) at the right time, for the right customer, within the resource limits established by the organization" (PMMJ, pg. 2)

- "The art and science of coordinating people, equipment, materials, money, and schedules to complete a specified project on time and within approved cost." (PMEC, pg. 8)

What is Project Management?

- "The application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project." (PMBOK, pg. 6)
  - Meeting or exceeding stakeholder needs and expectations invariably involves balancing competing demands among:
    - Scope, time, cost, and quality
    - Stakeholders with differing needs and expectations
    - Identified requirements (needs) and unidentified requirements (expectations)

- ***Communication and Leadership!***

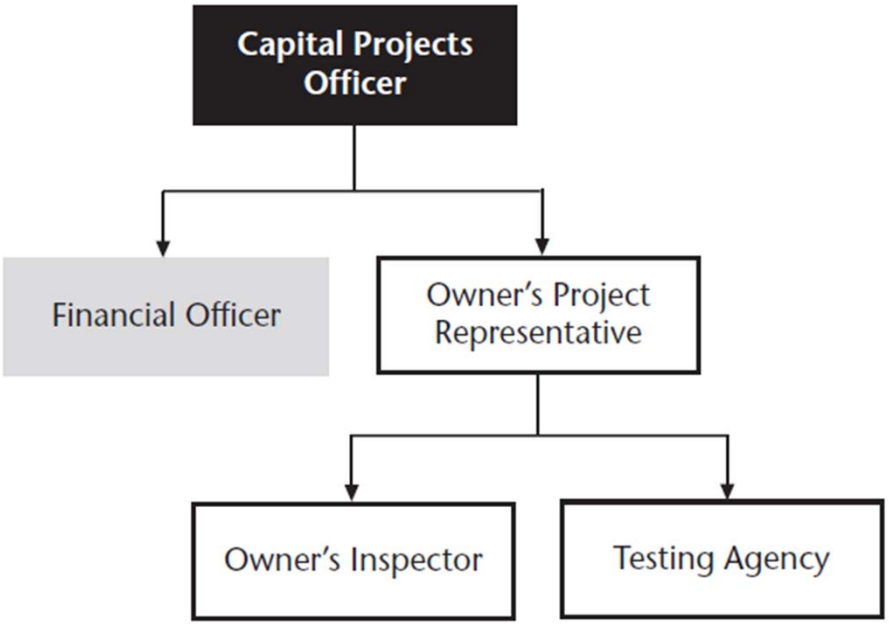
World's 5 Mega Construction Projects

Project Participants/Stakeholders

- **Owners** (Public, Private)
- **Designers** (Architect, Engineer)
- **Constructors** (General, Sub)

Project Participants - Owner

- **Role**
  - Initiates a project, finances it, contracts it out and benefits from its outputs



Owner's Organization for the Construction Project

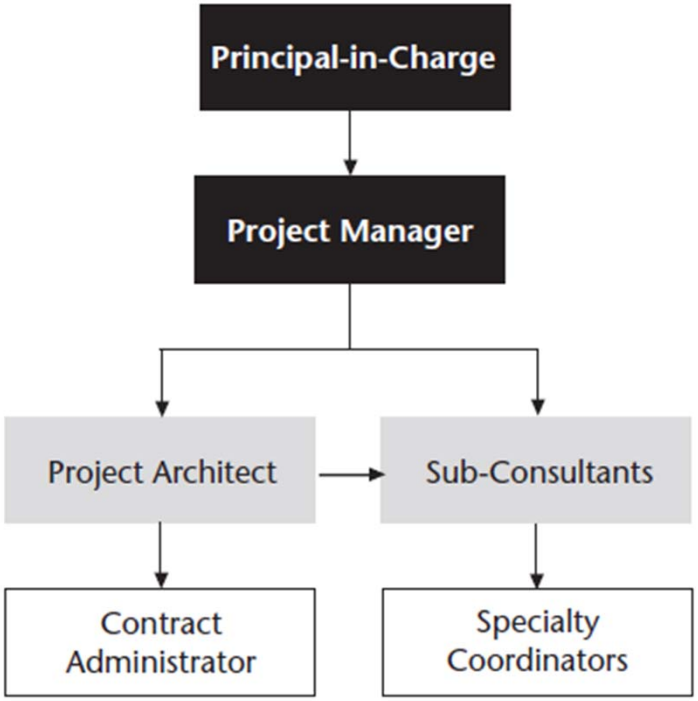
- **Capital Projects Officer**
  - Owner or upper-management-level individuals
  - Makes ultimate decisions, authorizes major changes, and oversees the construction phase periodically
- **Financial Officer:** Manages the cash flow of the project
- **Owner's Project Representative**
  - Owner's project manager responsible for the project
  - Primary contact participating on a daily basis
- **Owner's Inspector (clerk of the works)**
  - Mainly observes, reports the quality of construction works
- **Testing Agency**
  - Outside testing agency contracted by the owner
  - Tests materials to verify their specified standard

**Shop Drawings*: Drawings explaining item fabrication and installation produced by contractors, suppliers, manufacturers, etc. (e.g., 50m = 5 x 10m-rebar)*

**RFI*: Information request from CM to A/E to clarify any parts of construction documents*

Project Participants – Designer (A/E)

- **Role**
  - Develops the owner's concept on paper and construction documents
  - Architect: Lead designer administrating construction as the owner's agent
  - Engineer: Designs structural, mechanical, electrical, and plumbing systems

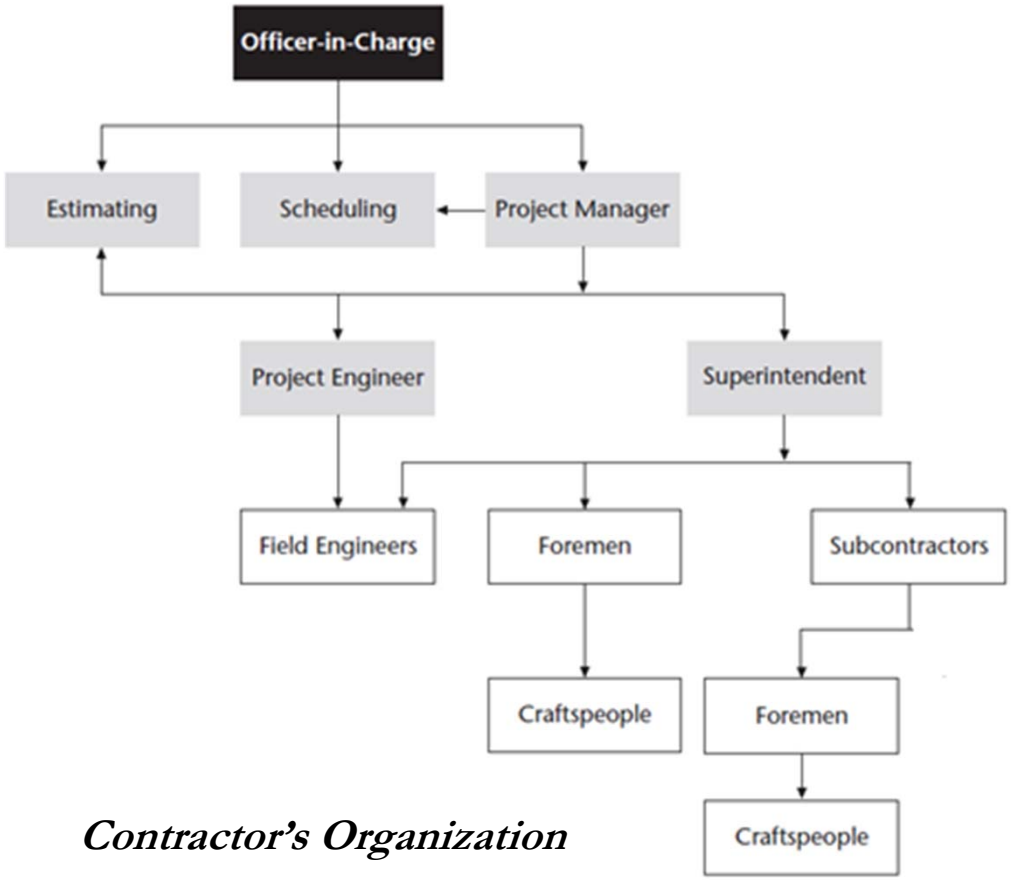


Architect's Organization

- **Principal-in-Charge:** Owner or upper-management-level person
  - Makes ultimate decisions and handles major issues
- **Project Manager:** Primary contact
  - Responsible for the project, organizes the project team
- **Project Architect**
  - Designs the project and produces construction documents
- **Contract (construction) Administrator**
  - Processes shop drawings, payments, RFI, change orders
  - Observes construction and have meetings with the contractor
- **Sub-consultants**
  - Engineering firms: Civil, environmental, structural, mechanical, or electrical
  - Interior design firms
- **Specialty coordinators**
  - Inspectors and engineers hired by sub-consultants
  - Provides services on the jobsite during the construction phase

Project Participants - Contractor

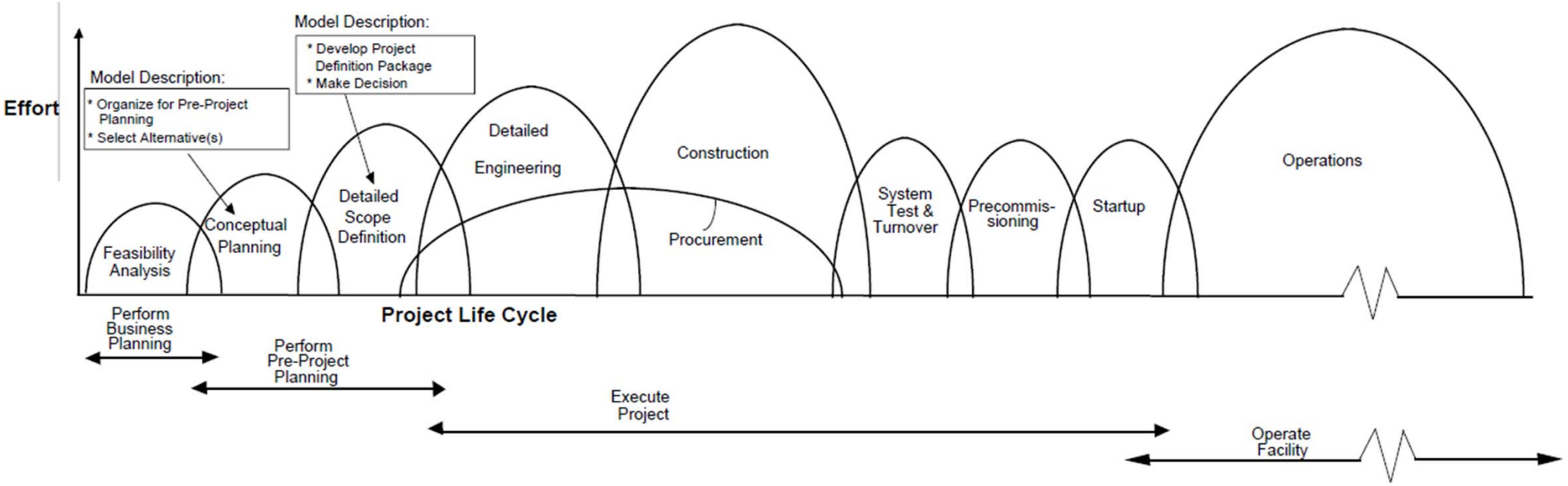
- **Role**
  - Provides the labor, material, equipment, and expertise to complete the project



Contractor's Organization

- **Office-In-Charge:** Owner or upper-management-level
  - Makes ultimate decisions and handles major issues
- **Project Manager:** Primary contact
  - Responsible for the project, organizes the project team
- **Superintendent**
  - Responsible for the project's physical construction (labor, material , equipment, safety, subcontractor, etc.)
  - Primary contact participating on a daily basis
- **Project Engineer**
  - Performs paperwork activities to keep the project going and on track for the project manager (subcontract agreements, material submittals, shop drawings, payment requests, change orders, RFI)
- **Field Engineer**
  - Lowest tier on the management side of the contractor's employee
  - Issues RFI to clarify the construction documents, order materials, review shop drawings and submittals, etc.
  - Assists the superintendent

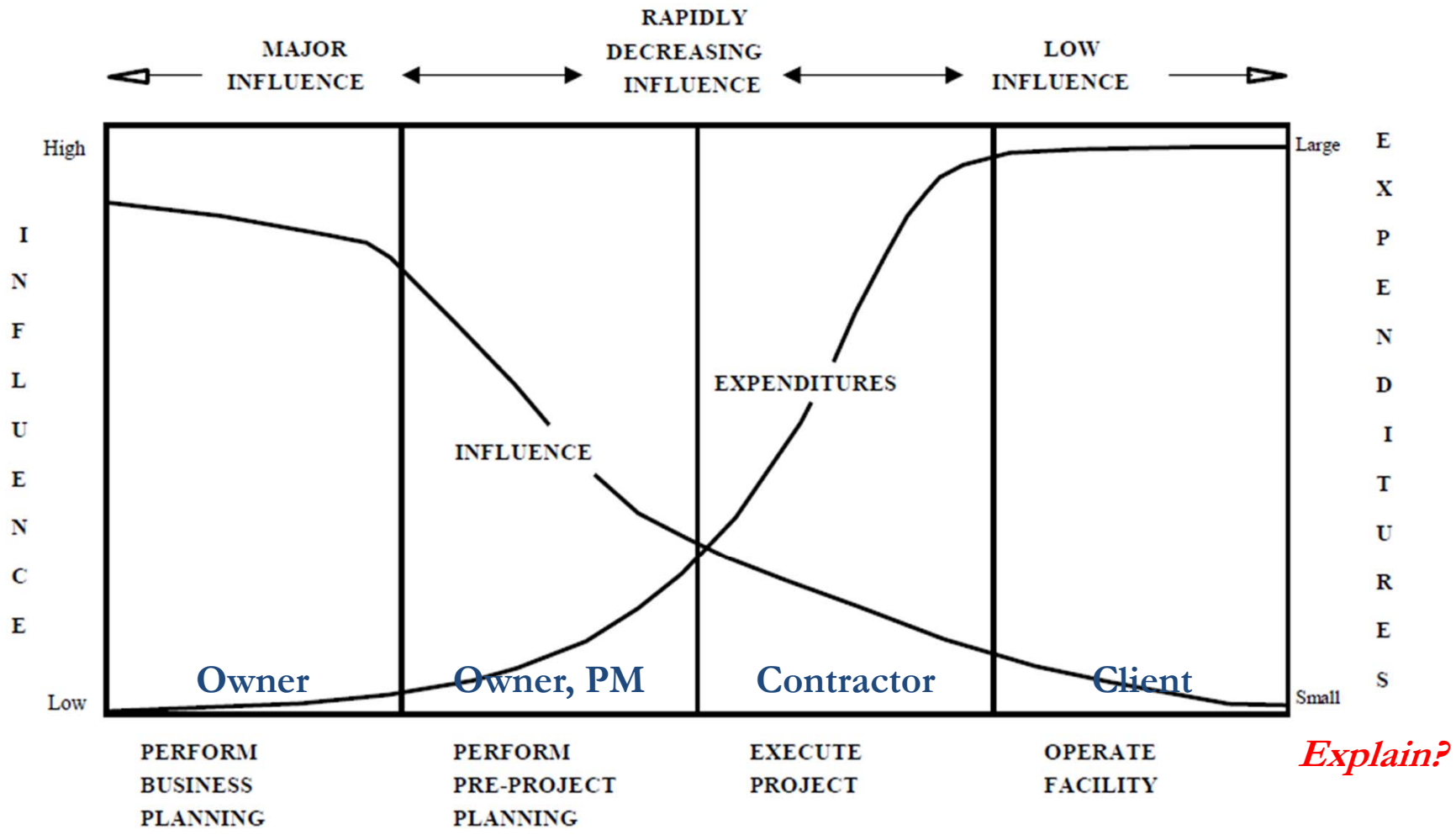
Project Lifecycle



Typical Project Objectives

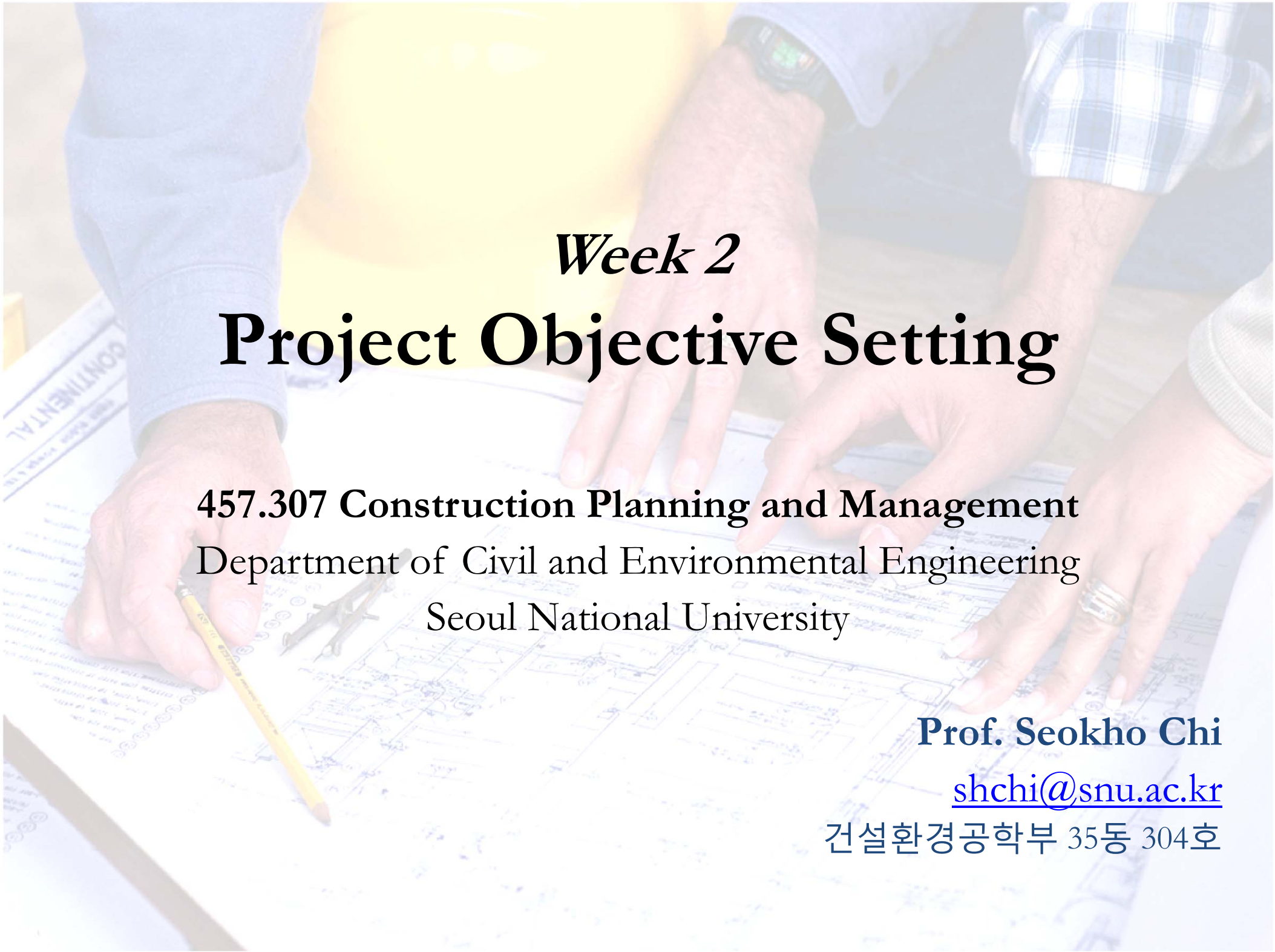
- Project performance (scope and reliability)
- Safety
- Cost control
- Schedule control
- Quality management
- Contract administration
- Human resource management
- Dispute minimization

Cost-Influence Diagram



Explain?

"Influence" reflects a company's ability to affect the outcome of a project.



Week 2

Project Objective Setting

457.307 Construction Planning and Management

Department of Civil and Environmental Engineering

Seoul National University

Prof. Seokho Chi

shchi@snu.ac.kr

건설환경공학부 35동 304호

Construction Industry Teams

- Construction is a people intensive industry.
- A project team exists for most construction projects.
- Multiple and overlapping teams are common.
- Effective teams are more likely with a proactive team building process.
- Successful project outcomes are more likely when effective teams are in place.
- Costs associated with team building are very low when compared to the benefits.

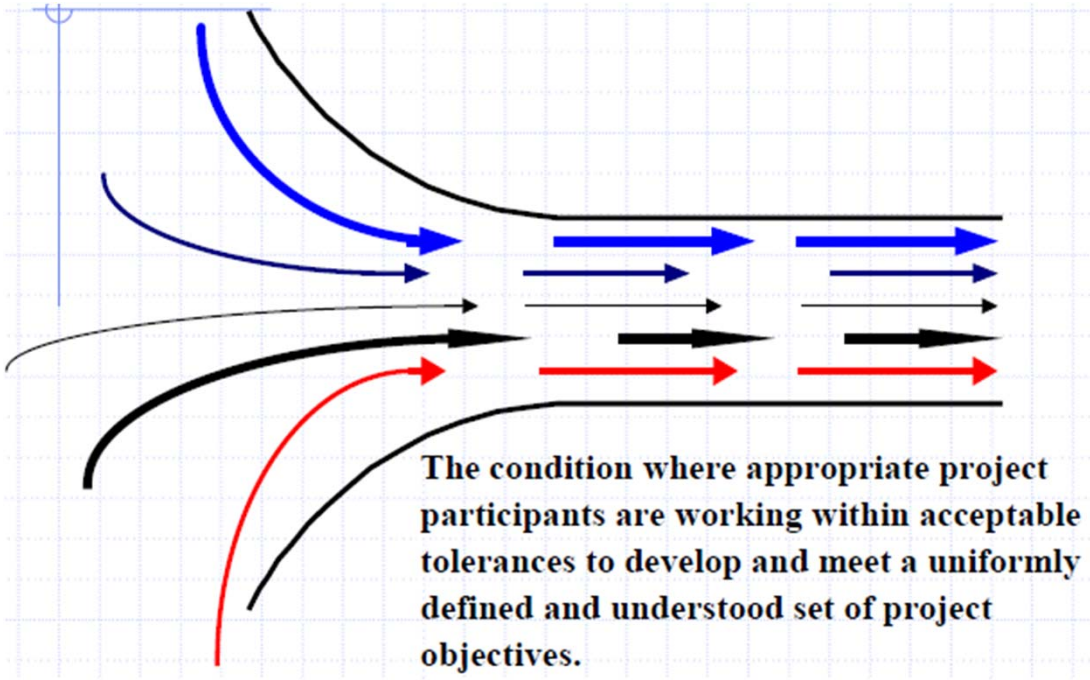
Construction Team Participants

- **Project advocates (owner representatives)**
  - Project manager
  - Contracting officer
  - Owner/client representative
- **Project delivery team**
  - Project manager
  - Contracting officer
  - Owner/client representative
  - A/E designer
  - Specialty consultant
  - Construction contractor
  - Construction manager
- **Make-up of team varies on type and size of project, owner's staffing, etc.**

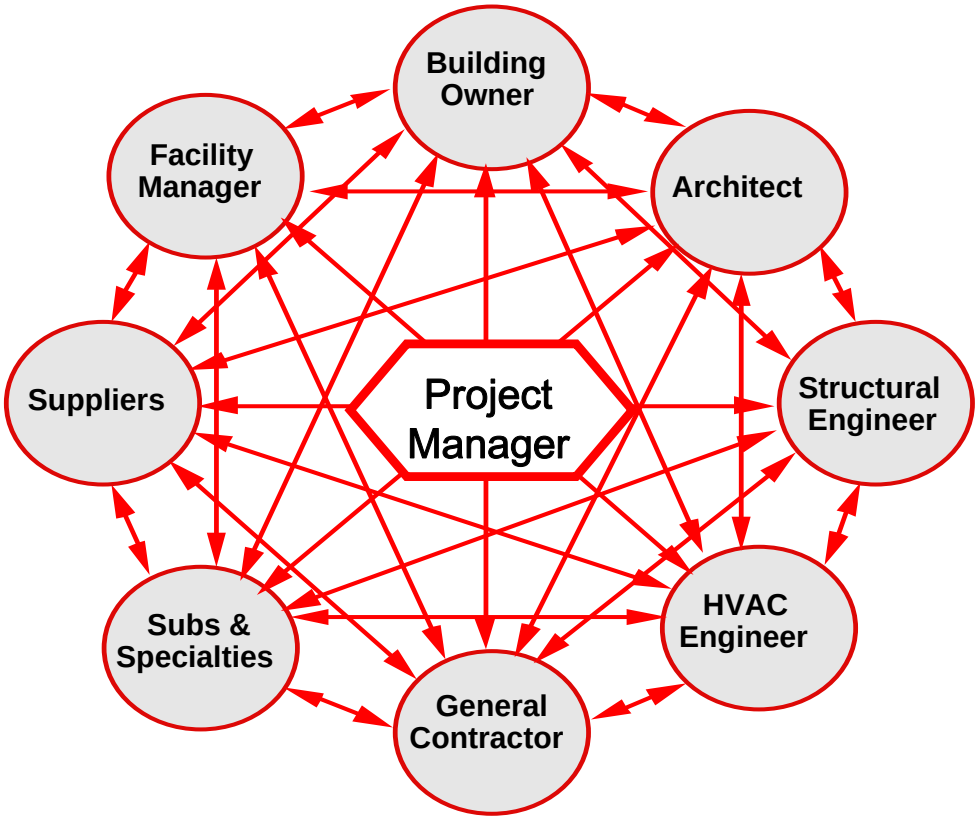
Team Leader Skills & Alignment

- **Team leader skills**
  - Leadership and decision-making
  - Facilitation
  - Coordination of tasks
  - Communication
  - PM knowledge
- **Alignment**
  - Everyone moves

    to the same direction!



Why is Alignment Difficult to Achieve?



Different Perspectives on Changes

"We commission hundreds of new build and refurbishment projects of various sizes every year. Many of them do not complete on time or within budget. As a result, we suffer significant losses in terms of both higher construction costs and delayed business opening."

<Client (Owner)>

<Project Manager>

"Many serious project delays can be traced to some seemingly insignificant delays that happened sometime ago somewhere upstream in the project delivery process."

<Contractor>

"We often have to delay the work on-site and even re-do the work because the drawings provided by the designers are either incomplete or inconsistent with the site conditions."

<Design Consultant>

"In many of our projects, we have to make late changes to the design because the client keeps changing their requirements. This results in a waste of staff time as high as 30% in a typical project."

<Source: Managing Changes in Construction Projects>

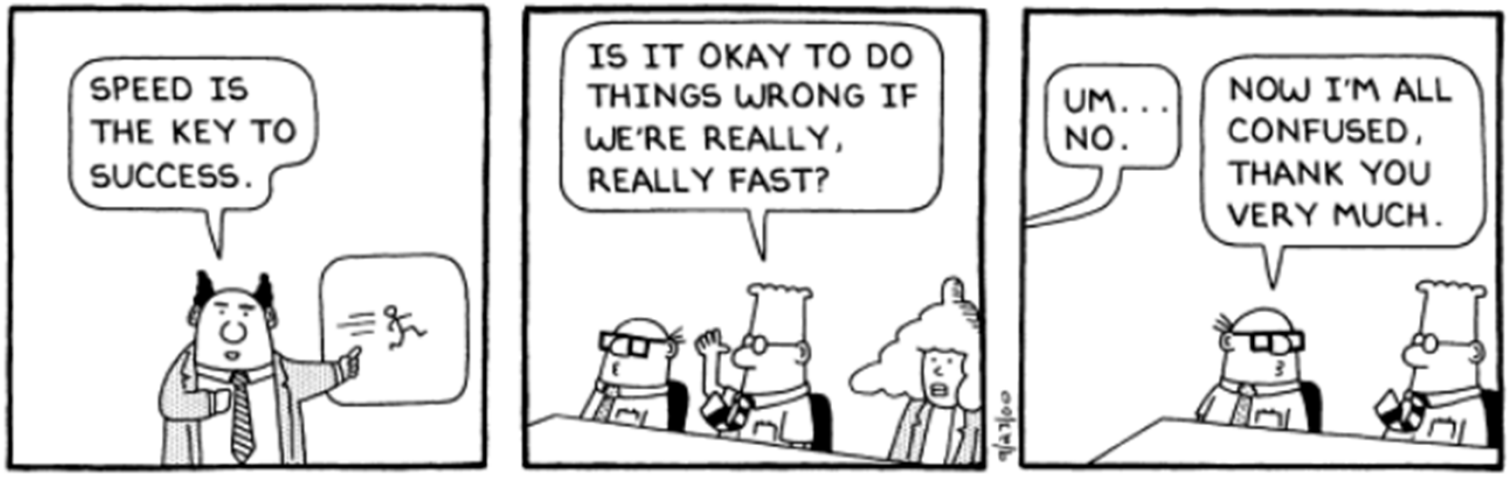
Teamwork Success Factor

- Starts with sponsor defining goals, objectives, priorities, etc.
- Proactive: process starts at project beginning and last for entire project.
- Focus on common goals and priorities
- PM is team leader.
- Effective team building process

- **Objective-setting modifies behavior in three ways**
  - Focuses attention: "should be doing"
  - Regulates energy expenditure: "don't waste time"
  - "Hard" goals increase persistence: "push yourself hard"

Problems in Objective Setting

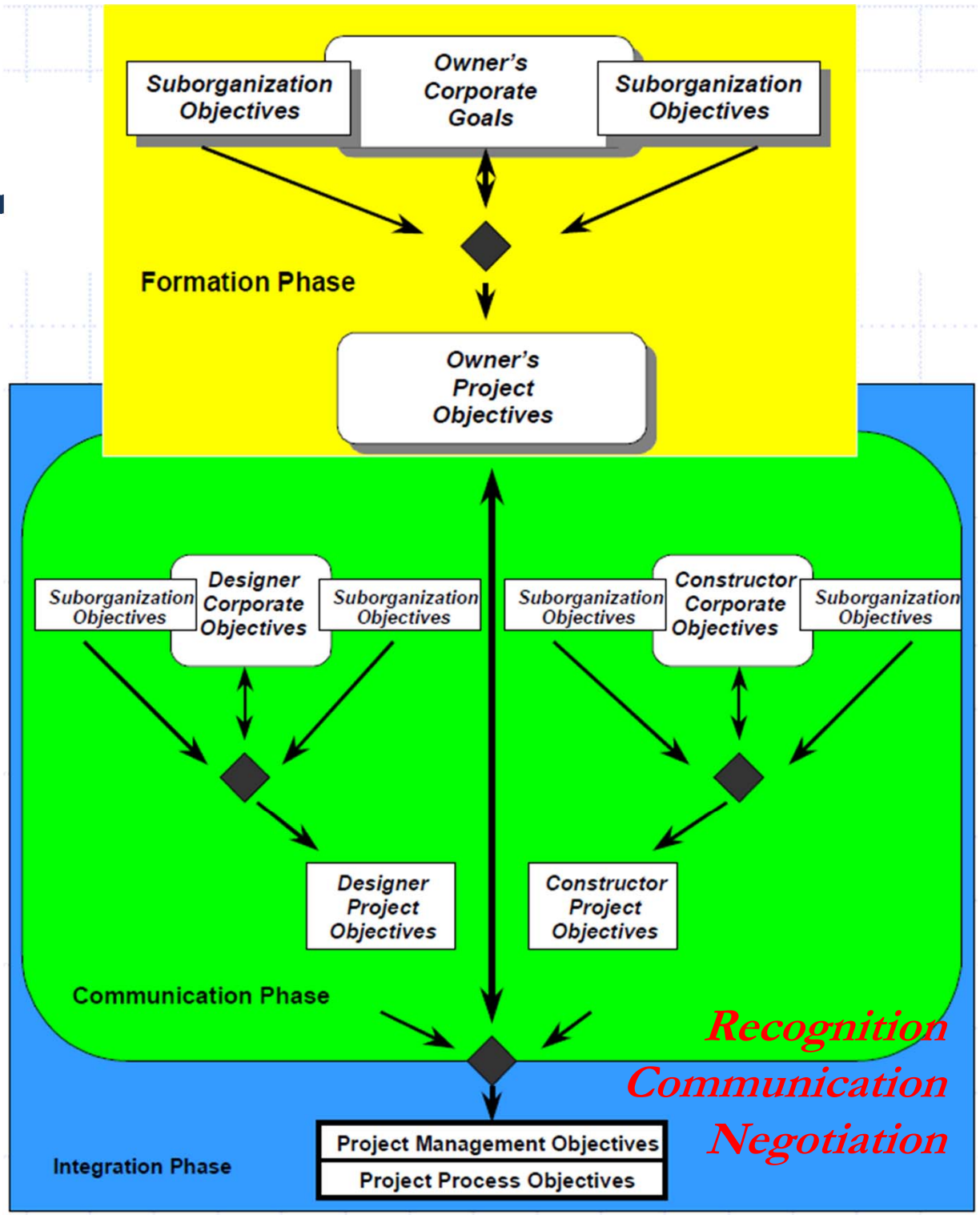
- **The Problem**
  - Different functional groups
  - Projects have complex objectives
  - Objectives often in direct conflict
  - Multiple decision makers
  - Change over time



Objective Setting

- Agreement

- **Formation Phase:** Form a single set of project objectives.
- **Communication Phase:** Disseminate directly or indirectly the developed objectives.
- **Integration Phase:** Project objectives to form an integrated project strategy.



Project Management Objectives

- Safety
- Project cost
- Project schedule
- Operational performance
- Constructed quality measures
- Facility capacity
- Maintainability targets
- Technology content
- Startup goals

Project Process Objectives (*how to behave*)

- Team behavior/code of conduct
- Project procedures
- Roles and responsibility definition
- Communication channels
- Documentation protocols
- Dispute resolution
- Quality control and testing

Checklist

- **Is the objective:**
  - Specific and identifiable?
  - Oriented toward single-ended results?
  - Set against deadlines?
  - Attainable?
  - Responsive to organizational needs?
  - Controllable?
  - Assignable to responsible parties?

Example – Project Objectives

- **Highway project**
  - Project Management
    - No lost workday accidents
    - Ahead of schedule by 5%
    - Within budget
    - No disputes
    - No rework
    - Earn $60,000 in incentives
  - Project Process
    - Open and honest, respect and trust
    - Productive meetings
    - Public relations
    - Conflict resolution process and time limits

Example – Project Objectives

- **Highway project – more specific objectives**

Objective		Goal	Stretch Goal
Safety	Recordable Incident Rate	3.8	3.0
	Lost Workday Case Incident Rate	2.0	1.5
Schedule	Intermediate Startup Schedules	Meet all dates	Ahead of schedule
	Startup All Systems	8/01/2013	7/15/2013
Quality	% Rework (Welder Repair Rate)	< 6% of direct work hours	< 5% of direct work hours
Cost	Total Cost	Meet business plan	10% saving
	Contingency Return	$6.5 million remaining	$7.5 million remaining

**RIR: Number of Claim / Number of Workers *1,000 (accidents per 1,000 workers)*

**LWCIR: Number of lost workday cases * 200,000 / total hours worked (accidents per hours)*

Alignment Checking

- **The Alignment Thermometer**

1: Strongly Disagree
5: Strongly Agree

Project Name:	LEVEL OF AGREEMENT					
ALIGNMENT ISSUES	1	2	3	4	5	SCORE
1. Stakeholders are appropriately represented on the Project Team.	0	3	5	8	10	
2. Project leadership is defined, effective, and accountable.	0	3	5	8	10	
3. The priority between cost, schedule and required project features is clear.	0	3	5	8	10	
4. Communication within the team and with stakeholders is open and effective.	0	3	5	8	10	
5. Team meetings are timely and productive.	0	3	5	8	10	
6. Our team culture fosters trust, honesty, and shared values.	0	3	5	8	10	
7. The PPP process includes sufficient funding, schedule and scope to meet our objectives.	0	3	5	8	10	
8. Reward and recognition systems promote meeting project objectives.	0	3	5	8	10	
9. Teamwork and team building programs are effective	0	3	5	8	10	
10. Planning tools (e.g., checklists, simulations and work flow diagrams) are effectively used.	0	3	5	8	10	
TOTAL SCORE						

Alignment Checking

- Step 1

Project Name: Project 1	LEVEL OF AGREEMENT					
ALIGNMENT ISSUES	1	2	3	4	5	SCORE
1. Stakeholders are appropriately represented on the Project Team	0	3	5	(8)	10	**8**
2. Project leadership is defined, effective, and accountable.	0	3	(5)	8	10	**5**
3. The priority between cost, schedule and required project features is clear.	0	3	(5)	8	10	**5**
4. Communication within the team and with stakeholders is open and effective	0	3	(5)	8	10	**5**
5. Team meetings are timely and productive.	0	3	5	8	(10)	**10**
6. Our team culture fosters trust, honesty, and shared values	0	3	5	(8)	10	**8**
7. The PPP process includes sufficient funding, schedule, and scope to meet our objectives.	0	3	(5)	8	10	**5**
8. Reward and recognition systems promote meeting project objectives.	0	(3)	5	8	10	**3**
9. Teamwork and team building programs are effective.	0	3	5	(8)	10	**8**
10. Planning tools (e.g. checklists, simulations and work flow diagrams) are effectively used.	0	3	5	8	(10)	**10**
TOTAL SCORE						67

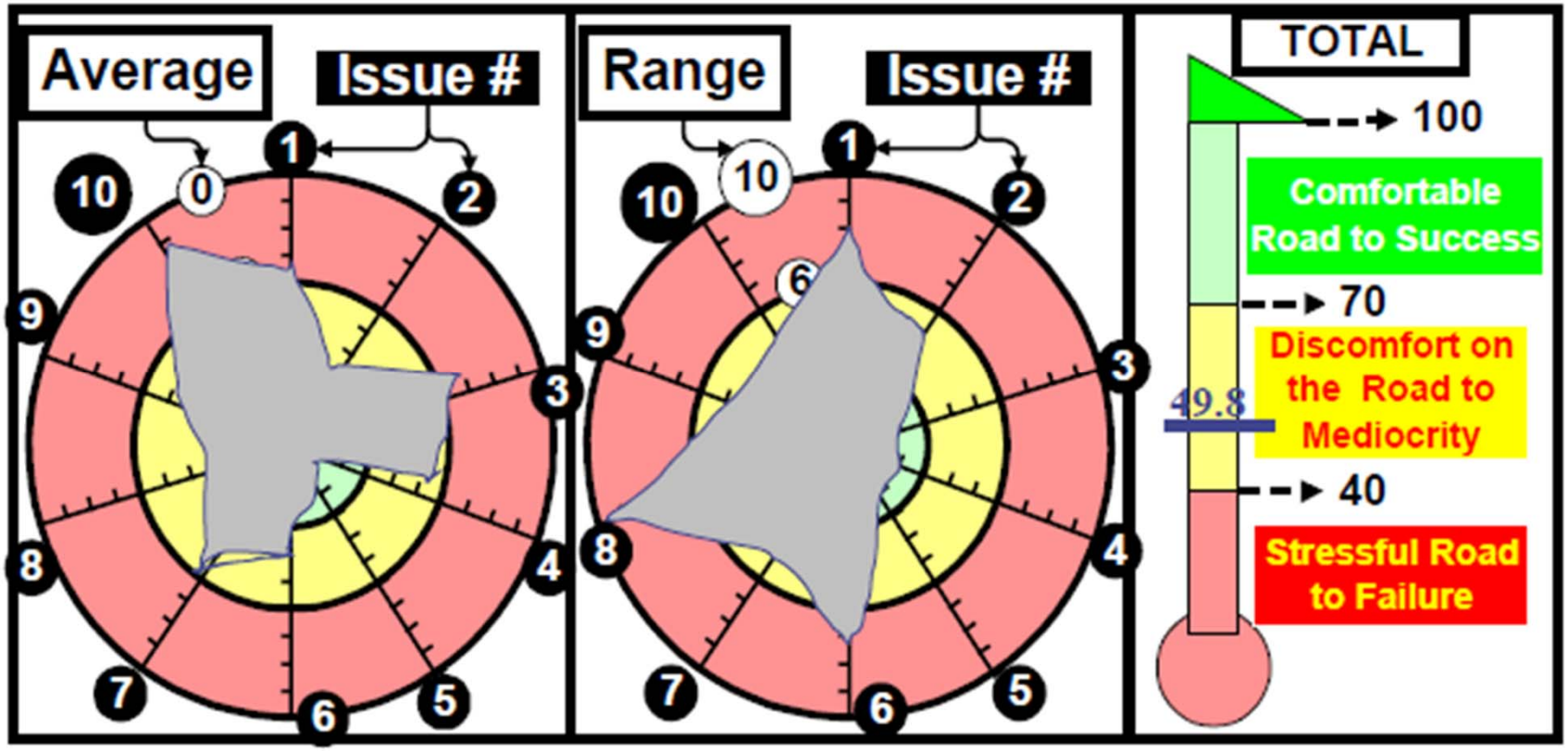
Alignment Checking

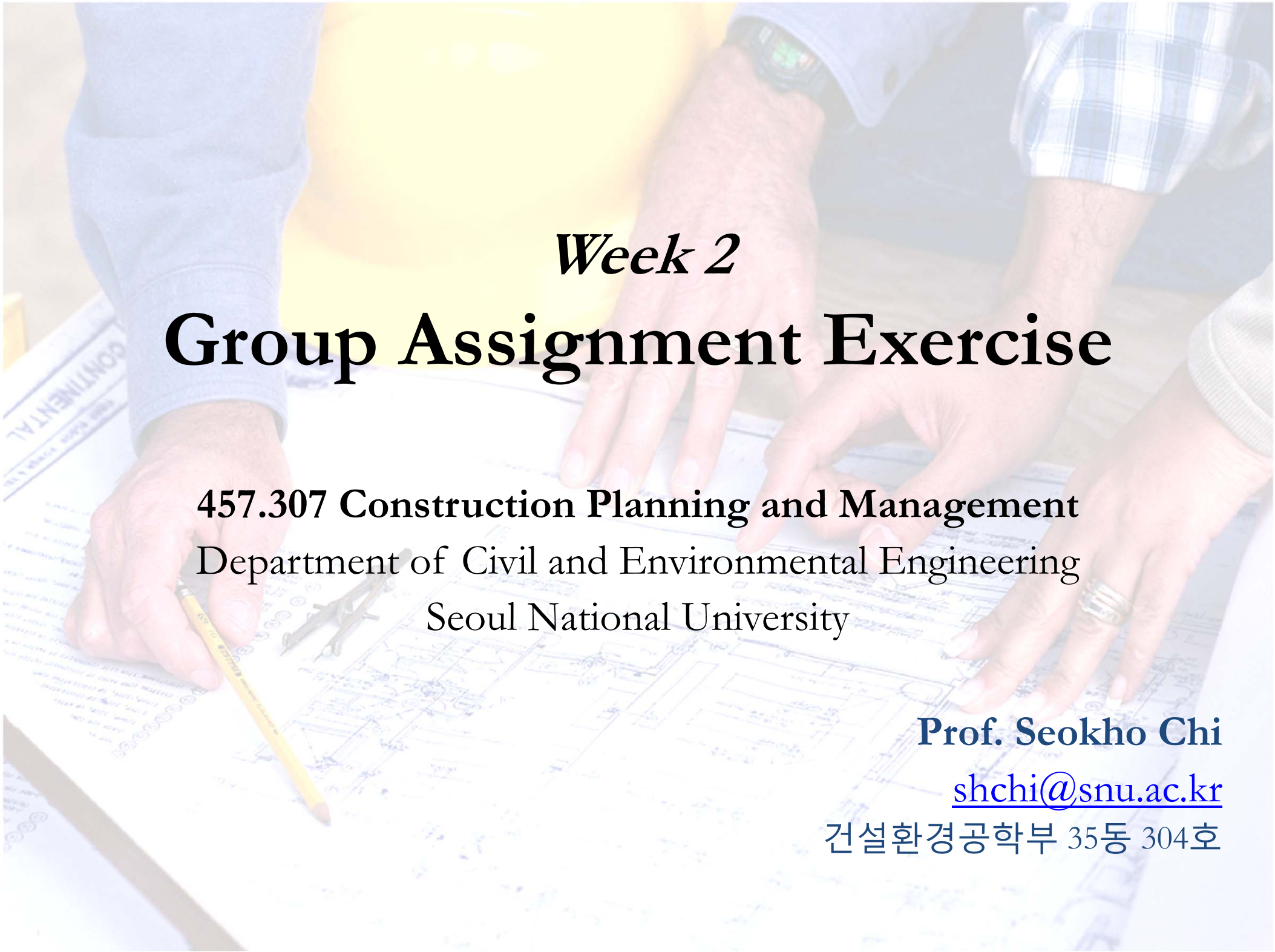
- Step 2

TEAM SCORE	Respondent									
Issue	1	2	3	4	5	6	7	Calculated Average	Calculated Range	Range/ Average
1	3	5	8	3	5	0		24/6 = 4.0	8	2.0
2	8	8	8	5	10	8		47/6 = 7.8	5	0.6
3	3	3	3	5	3	3		20/6 = 3.3	2	0.6
4	5	5	3	5	5	3		26/6 = 4.3	2	0.5
5	8	8	8	10	8	8		50/6 = 8.3	2	0.2
6	3	3	5	8	10	3		32/6 = 5.3	7	1.3
7	0	3	3	5	3	5		19/6 = 3.2	5	1.6
8	0	8	8	10	5	8		39/6 = 6.5	10	1.5
9	3	5	8	8	5	3		32/6 = 5.3	5	0.9
10	0	0	3	0	5	3		11/6 = 1.8	5	2.7
						TOTAL		49.8		

Alignment Checking

- Step 3





Week 2

Group Assignment Exercise

457.307 Construction Planning and Management

Department of Civil and Environmental Engineering

Seoul National University

Prof. Seokho Chi

shchi@snu.ac.kr

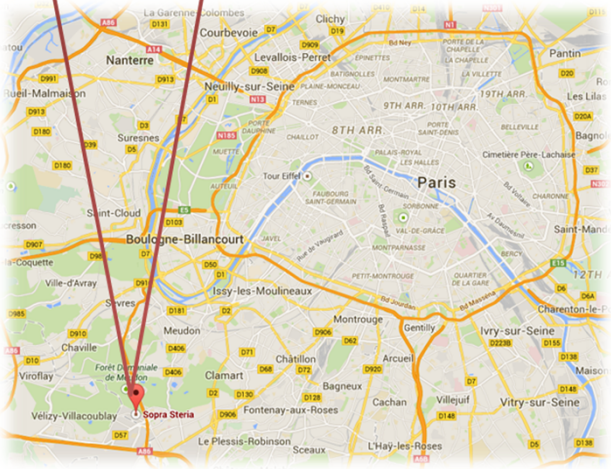
건설환경공학부 35동 304호

Group Assignment Exercise

- **Form a group of 5 students**
- **Select a team name and logo**
- **Agree to team assignments**
  - Group leader
  - Facilitator
  - Recorder
  - Others

Group Assignment Exercise

- **Project Scope Overview & Scope**



- World's first large scale **positive-energy** office building
- High Comfort & High Environmental Quality
- Overview of the **future of construction**
- 23,300sq.m.
- 1,500 persons
- 100,000,000€ Initial Budget
- March 2015 - March 2018

*여기서 설명하는 예제는 하나의 예시일 뿐 그룹과제의 리포트는 보다 깊이 있는 내용을 포함해야 함.

Group Assignment Exercise

- **Project Management Objectives**

Major Issues	Project Management Objectives
Positive-energy	• Net-zero energy after construction completed • Passive and renewable energy technologies integration
Comfort-oriented design	• High comfort offices • No rework
Others	• Completed within schedule • Within budget • No lost workday accident • No disputes

Group Assignment Exercise

- **Specific Project Management Objectives**

Objectives		Goal	Stretch Goal
Quality	High comfort perceived	90% satisfaction	95%
	Noise insulation	55dB	40dB
	Net-zero energy	0kWh/sq.m./year	-10kWh/sq.m./year
	Passive ventilation	Less cooling	No air conditioner
	Passive design	Basic operating needs of 45kWh/sq.m./year	25kWh/sq.m./year
	Photovoltaic panels	62kWh/sq.m./year	64kW/sq.m./year
	Technology integration	Biomass CHP, EMS, Velum	
Cost	Total cost	Meet project budget	5% saving
	Operation cost	Near zero	Earning money
Time	Meet schedule	Completed within 3 years	10% time saving
	No rework	Less than 5% rework	No rework
Safety	Safe working condition	No lost workday accident	90% worker satisfaction

*도심지 초고층 빌딩 건설프로젝트는?

Group Assignment Exercise

- **Project Process Objectives**
  - General processes to support achieving project management objectives

Major Issues	Project Process Objectives
Integrated Team	• Open and honest, respect and trust • Regular meeting and open communication channels • BIM-based design process
Environmental Dispute Resolution	• Multiple certification • Communicate to NGO
Public Communication	• Transparency and openness to public opinion • Regular publication on project advancement

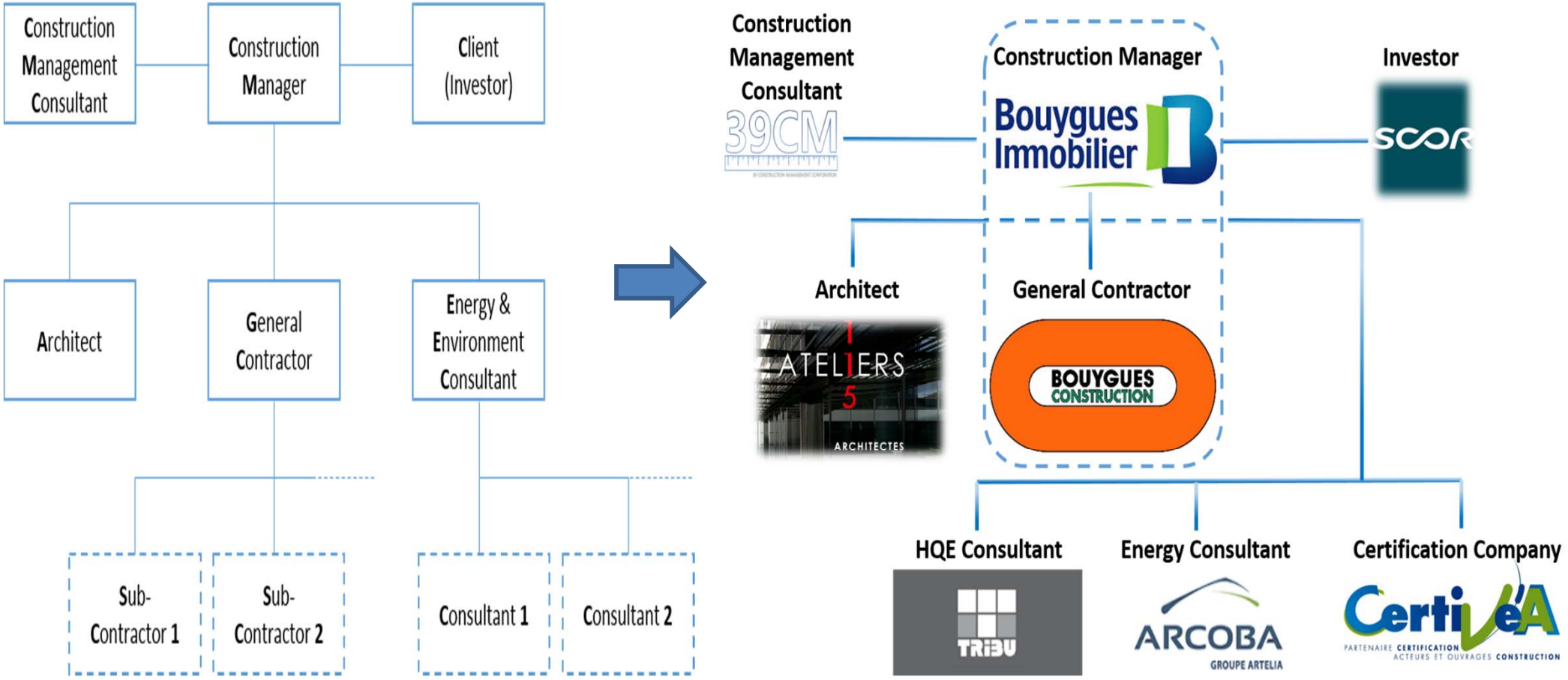
Group Assignment Exercise

- **Specific Project Process Objectives**

Objective		Goal	Stretch Goal
Integrated Team	Respect & trust	90% team members satisfied	95%
	Open	Daily meetings and feedback 60% documents open to everyone	 80%
	BIM integration	75% documents produced through BIM	90%
Environment	Certifications	1 certification	3 certifications
	NGOs	Monthly communication to NGOs	Bi-weekly
Public Communication	Open to public	Respond to public opinions	
	Advertisement	Monthly publication on project advancement	Bi-weekly

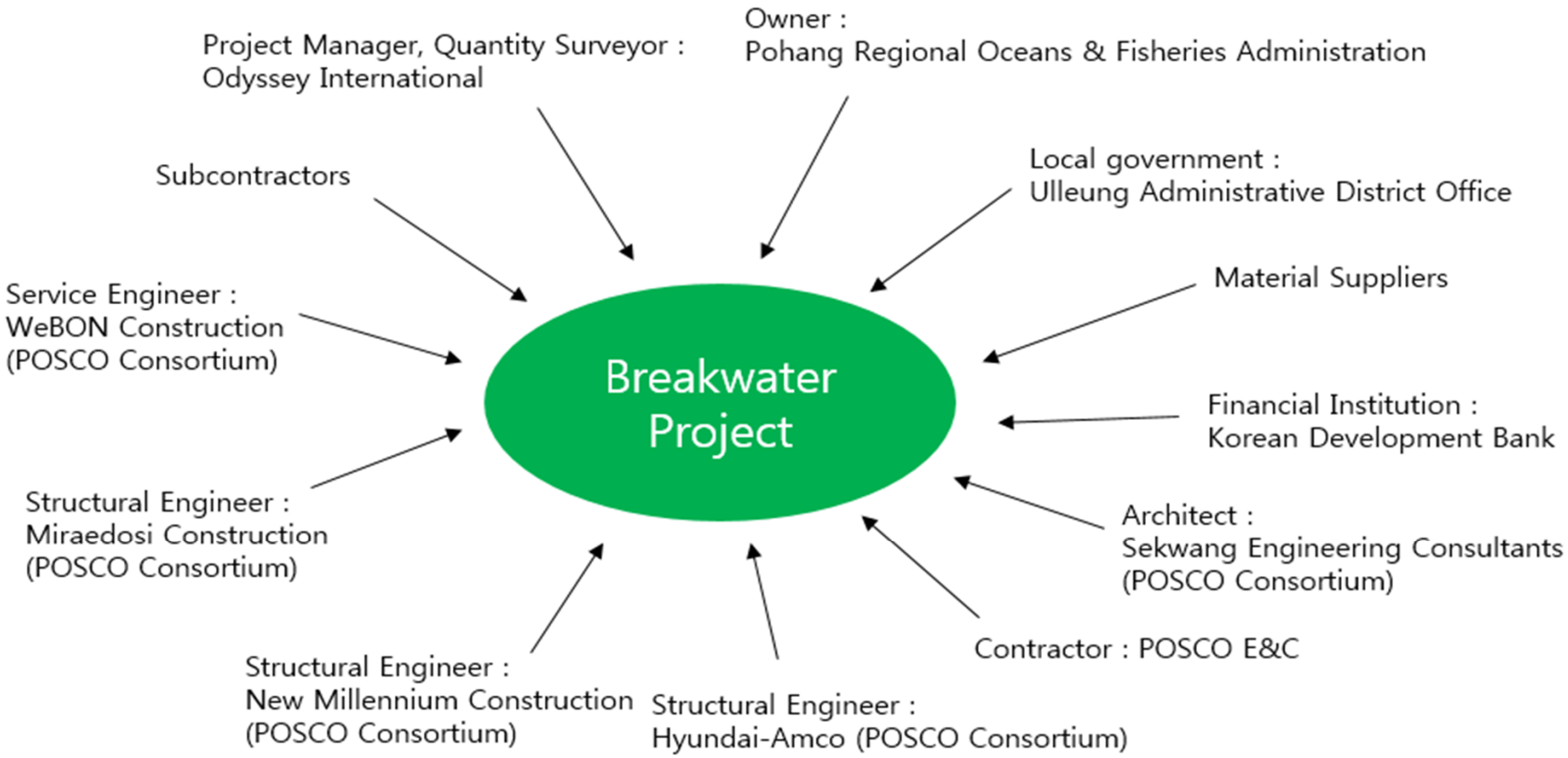
Group Assignment Exercise

- **Delivery and Contract Methods → Stakeholders**



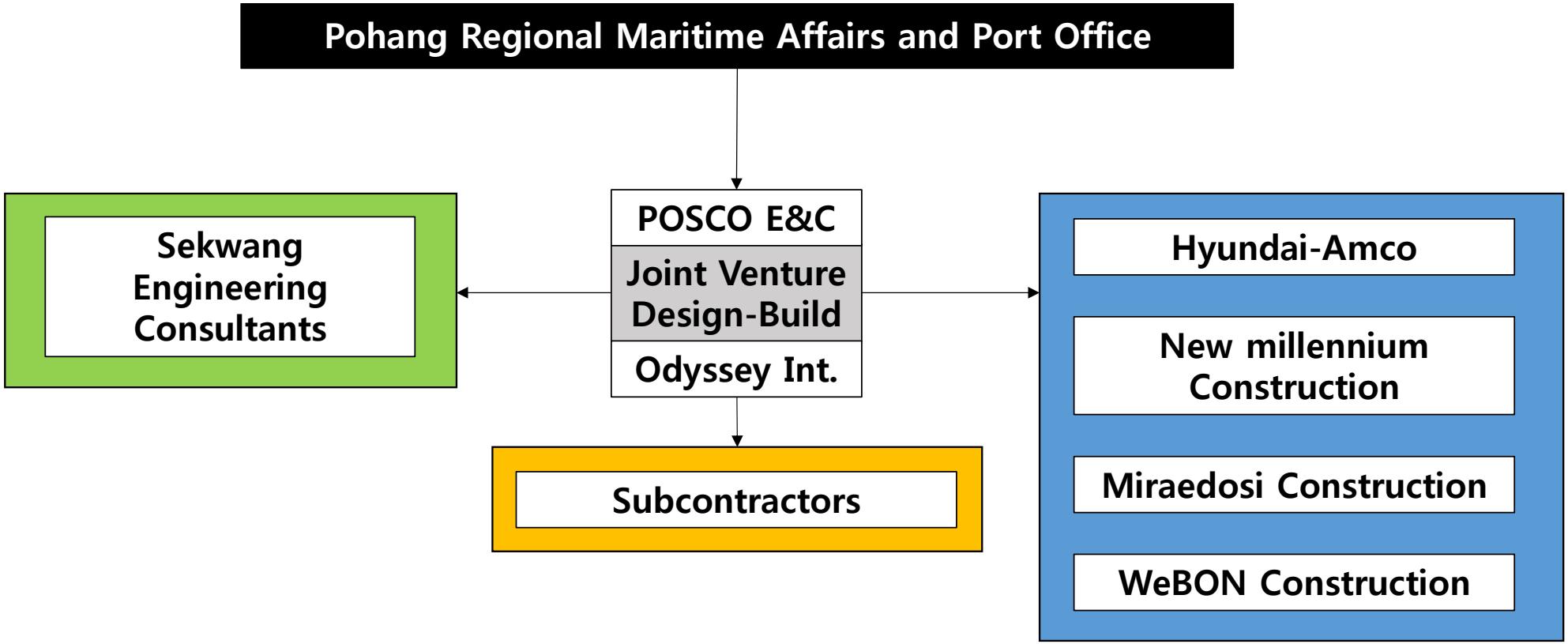
Group Assignment Exercise

- **Major Key Stakeholders (울릉도 방조제 건설프로젝트)**



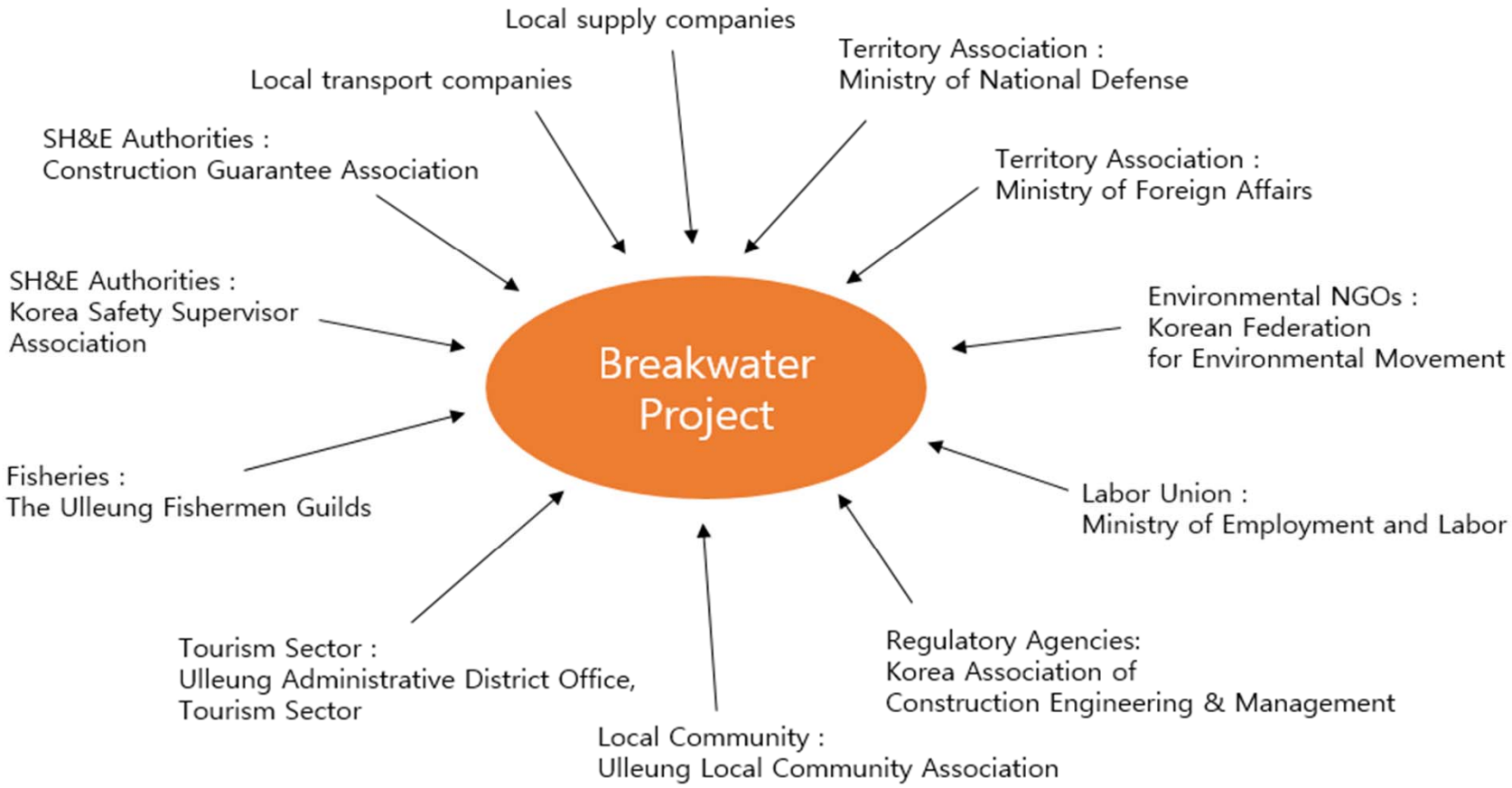
Group Assignment Exercise

- **Major Key Stakeholders (울릉도 방조제 건설프로젝트)**



Group Assignment Exercise

- **Other Stakeholders (울릉도 방조제 건설프로젝트)**



*도심지 초고층 빌딩 건설프로젝트는?