Week 2

Introduction to Project Management

457.657 Civil and Environmental Project Management

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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

Construction Industry

- Not a new industry

- Continuously evolving

Type	Residential	Building	Infrastructure	Industrial
				

Korean Construction Industry

- **Public VS Private**
  - Public construction (30%): Government projects (owner)
    - Most civil, infrastructure projects
  - Private construction (70%): Company projects (owner)
    - Most architecture projects

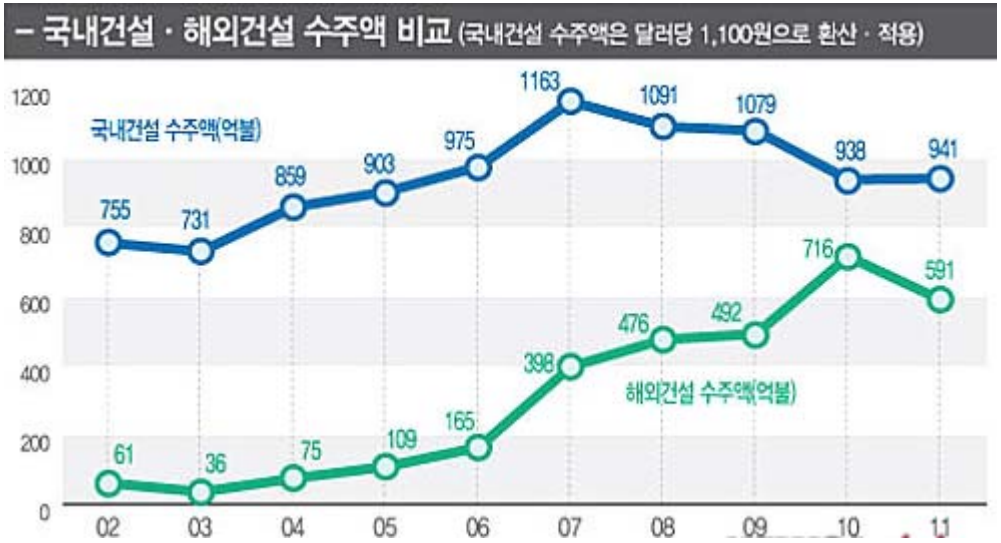
Korean Construction Industry

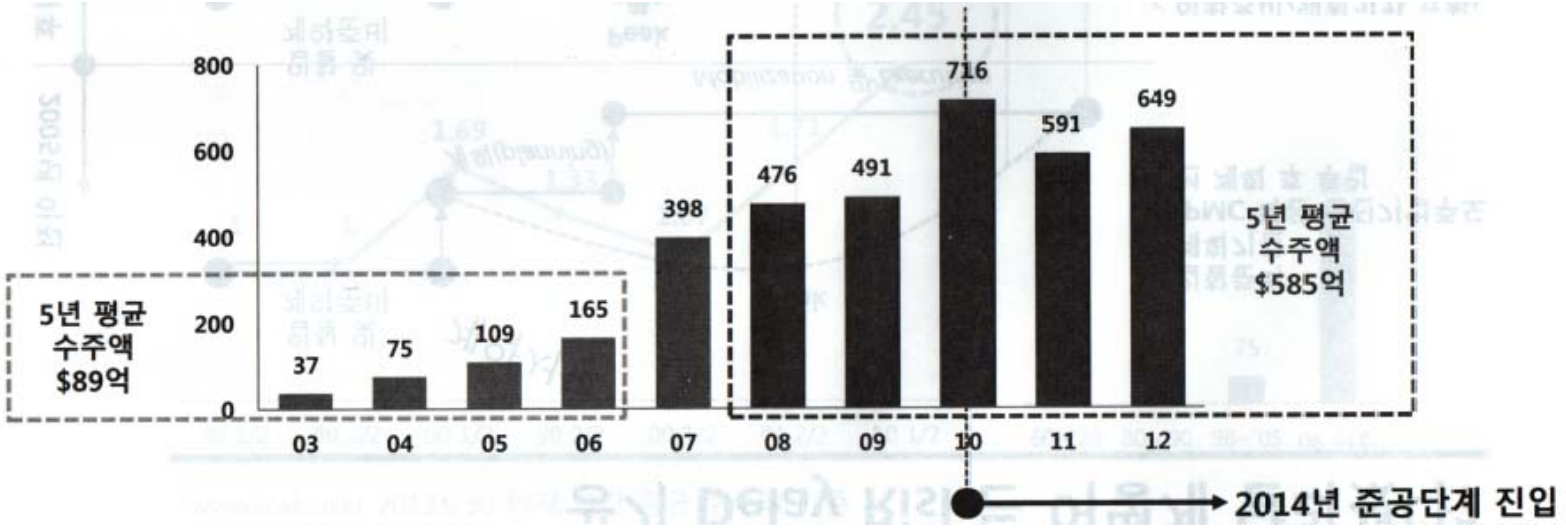
- **Housing Market**
  - 40% of Korean construction market
  - Apartment (50%) VS other residential (50%)
  - Apartment: 80% of new residential supply
  - However, still lack of supplies than other advanced countries
    - Korea: 3 inhabitants/house
    - Japan, U.S.: 2.4 inhabitants/house
    - France, Spain: 2 inhabitants/house

Nature of Construction Industry

- **Large (CERIC 2013)**

7.5% of the total employment in Korea (about 2,000,000 people)

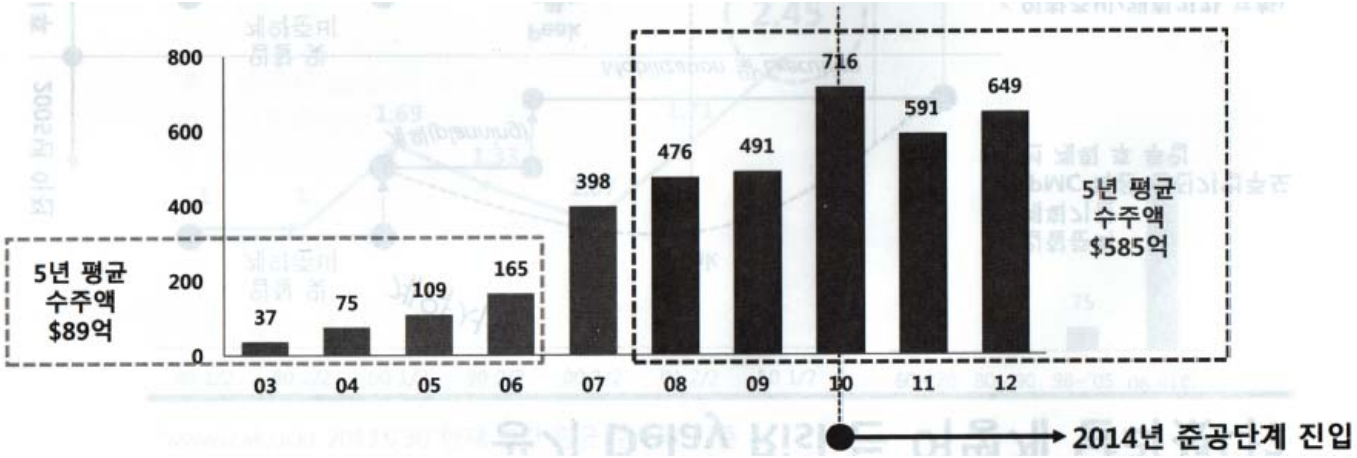




Nature of Construction Industry

Issues in Korean Construction Industry

- **Separated Bidding and Project Delivery Process**



Bidding Phase

Management Team
Market Analysis
Bidding Packaging
Contact Analysis
Feasibility Analysis
Negotiation
Others

Award

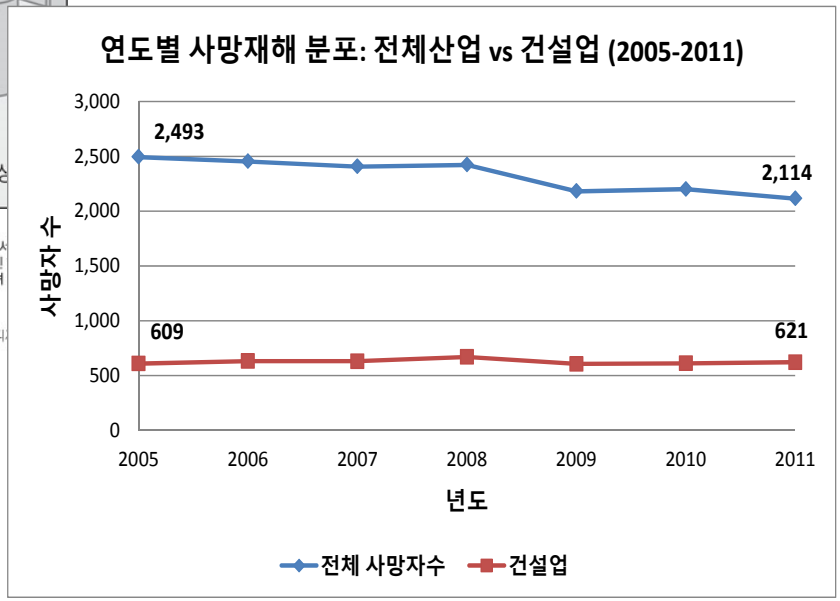
Implementation Phase

Construction Team
Project Delivery Plan
Specific Planning, Design,
Construction, and O&M
Contract Satisfaction
Subcontracting
Others

Issues in Korean Construction Industry

- **Construction Safety**

(한국산업안전공단, 2011)



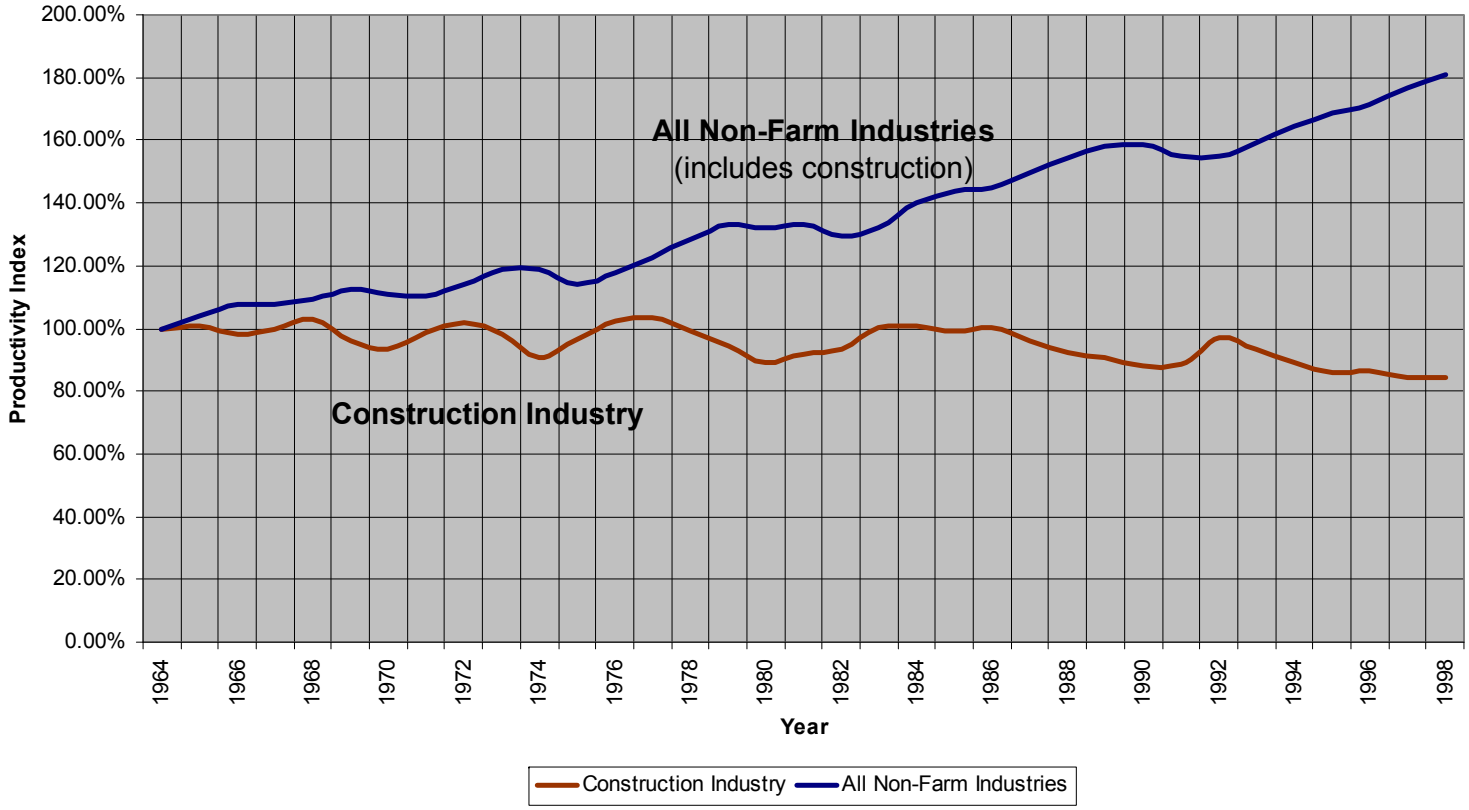
2011	Total	Rate to Industry
Injuries in Construction	22,782 Workers	25%
Fatality	621	30%
Fatality / 10,000 Workers	2.0	U.S., Japan 1.0

Issues in Korean Construction Industry

- **Productivity**

**2012년 대한민국 건설업의 노동생산성을 전년도 대비 20.1% 하락했으며 기준점인 2008년에 비해서는 절반수준으로 하락하였음*

Productivity Index (1964-1998)
(Constant $ of contracts / workhours of hourly workers)
sources: US Bureau of Labor Statistics, US Dept. of Commerce



Issues in Korean Construction Industry

- **Public-Private-Partnership**
  - 정부의 공공서비스 제공 목표 = 민간업체의 수익창출 목표
  - **BTO (건설-이전-운영) 방식** (도로, 철도, 항만 등의 교통시설)
    - 사회기반시설의 소유권이 완공과 동시에 정부로 이전되며 사업시행자는 시설을 운영하고 투자비를 회수함. 사업시행자가 사용료를 통해 직접 투자비용을 회수하기 때문에 사업시행자 입장에서는 수익성이 핵심요소임.
  - **BTL (건설-이전-임대) 방식** (학교, 복지시설, 환경시설, 군주거시설 등의 SOC)
    - 사회기반시설의 소유권이 완공과 동시에 정부로 이전되며, 사업시행자는 시설을 운영할 권리, 그리고 운영성과(유용성, 서비스 품질 등)에 기초하여 일정기간 동안 정부지급금을 받을 권리가 부여됨.

**MRG (Minimum Revenue Guarantee, 최소운영수입보장)*
향후 20-30 년간 운영수입을 보장
예를 들어 경춘고속도로: 15 년간 예상 수입의 60-80%,
인천대교: 15 년간 80% 를 각각 보장하고 미달하면 정부가 부족분 지급

세금 먹는 하마로 전락한 주요 민자고속도로

구간	예상대비 실제교통량	총사업비	정부 손실 보전금	잔여MRG 기간
인천공항	42.5%	1조7440억원	9076억원	10년
천안~논산	57.4%	1조7297억원	3496억원	12년
대구~부산	55.3%	2조7477억원	2357억원	16년
일산~퇴계원	93.3%	2조2792억원	625억원	17년
서울~춘천	64.8%	2조1833억원	208억원	13년
서수원~평택	38.1%	1조6869억원	93억원	14년
부산~울산	52.2%	1조4777억원	601억원	28년
용인~서울	52.3%	1조5256억원	39억원	8년
인천대교	71.2%	1조5201억원	74억원	14년

2010년 기준, 손실보전금은 2011년 기준 자료: 국토연구원

Importance of Project Management

CONSTRUCTION PROJECT

Residential	Building	Infrastructure	Industrial

Planning → **Design** → **Construction** → **Operation & Maintenance**

(PMBOK, 2000)

Scope Management	**Procurement** Management
HR Management	**Decision/Risk** Management

Social Science Oriented

Time Management	**Cost** Management
Quality Management	**Safety** Management

Engineering Oriented

PROJECT SUCCESS!

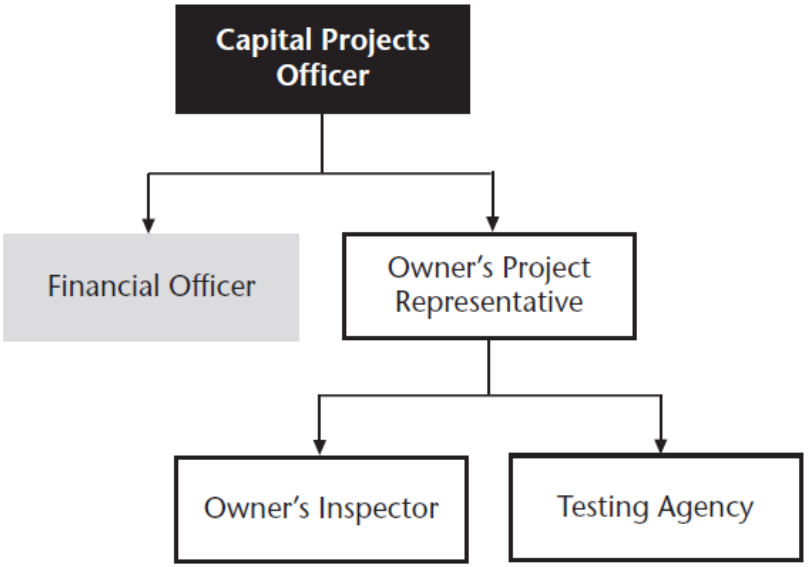
Happy Client
Happy Constr. Firms
Happy Society

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

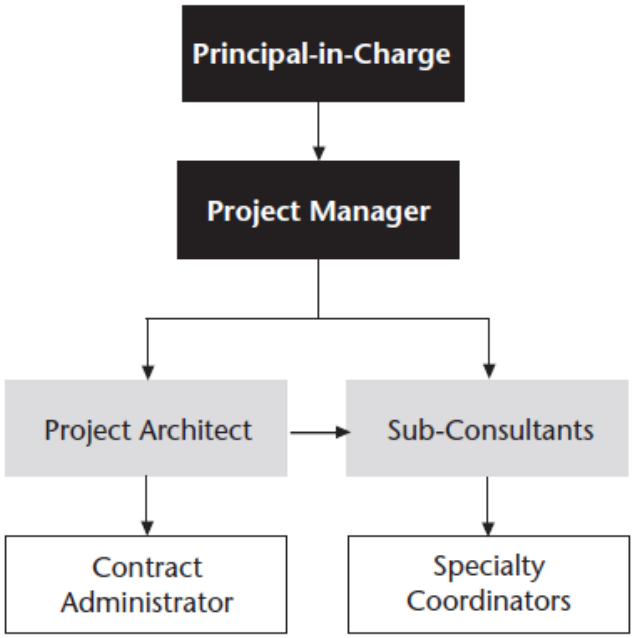
- **Capital Projects Officer**
  - Owner or upper-management-level individuals
  - Makes ultimate decisions, authorizes major changes, and oversees the construction phase periodically
- **Financial Officer:** Manages the cash flow of the project
- **Owner's Project Representative**
  - Owner's project 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

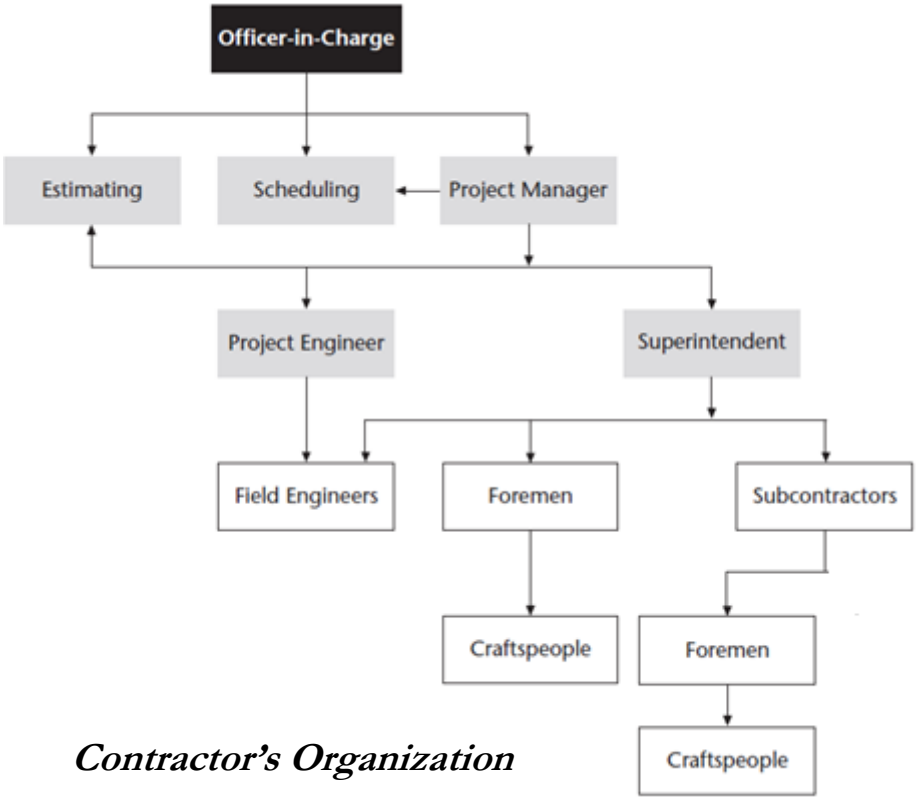


Architect's Organization

- **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

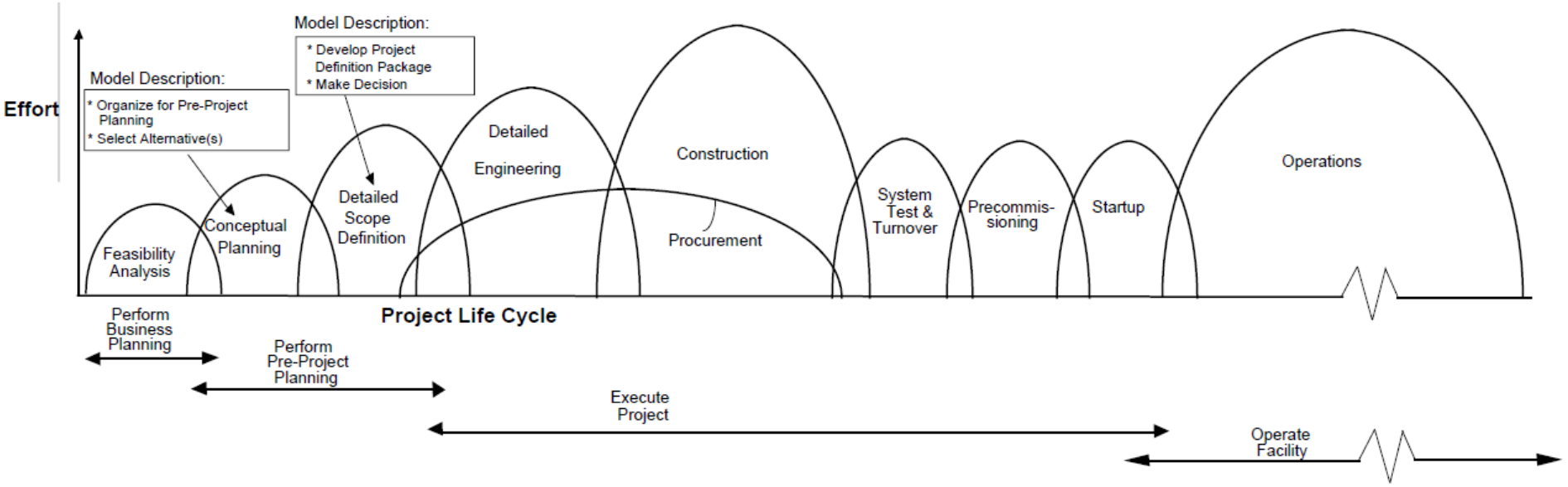
- **Role**
  - Provides the labor, material, equipment, and expertise to complete the project



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

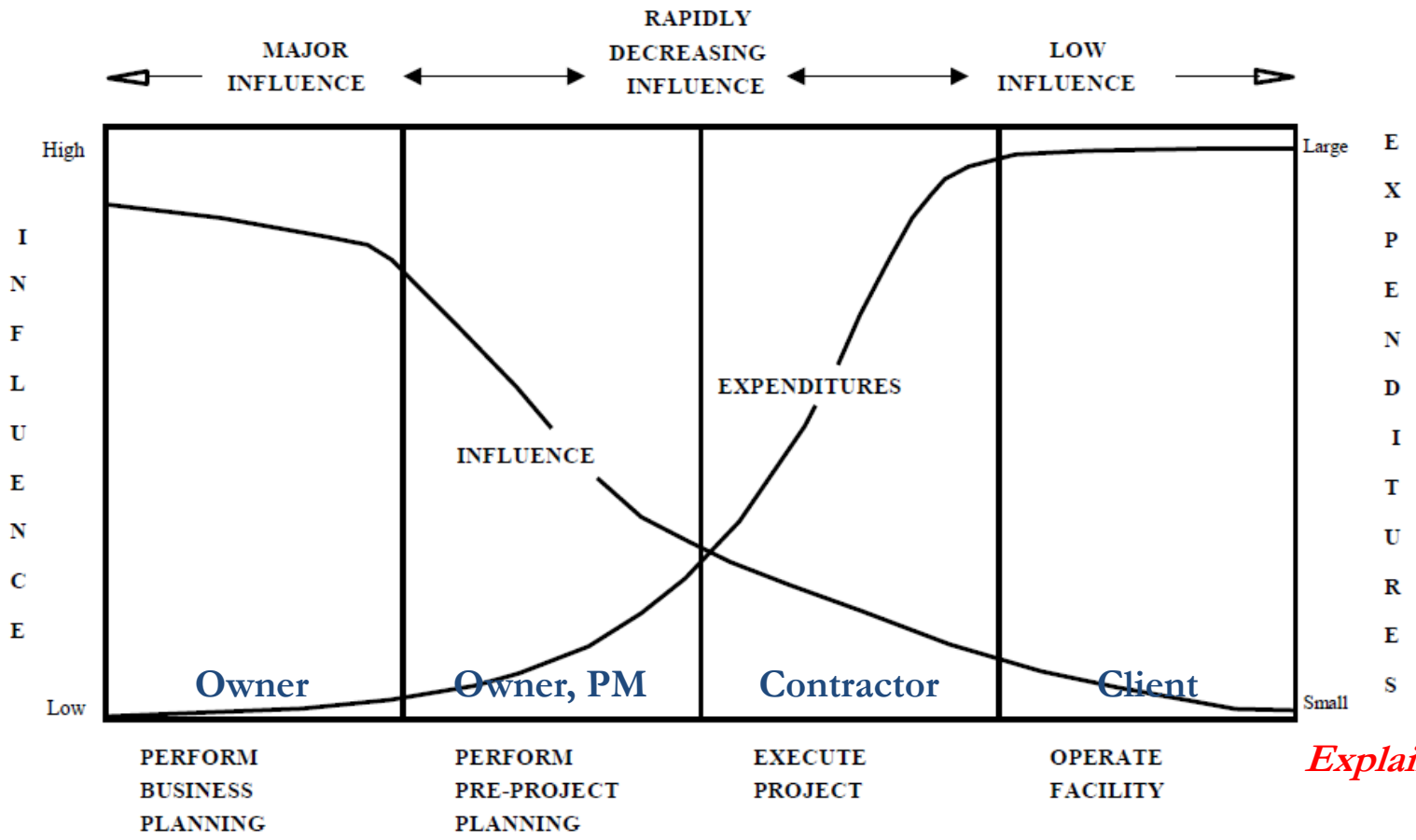
Project Lifecycle



Typical Project Objectives

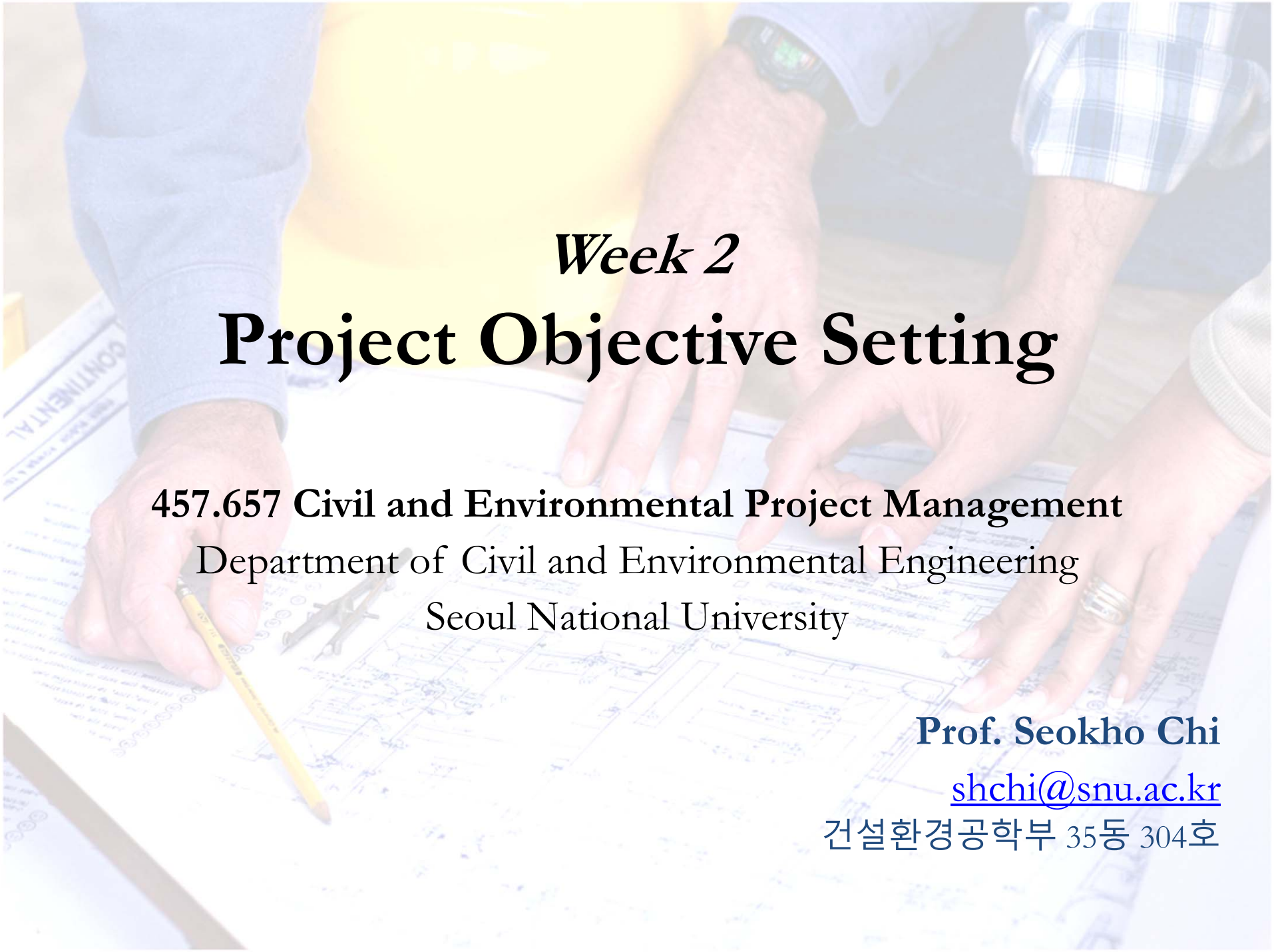
- Project performance (scope and reliability)
- Safety
- Cost control
- Schedule control
- Quality management
- Contract administration
- Human resource management
- Dispute minimization

Cost-Influence Diagram



Explain?

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



Week 2

Project Objective Setting

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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.

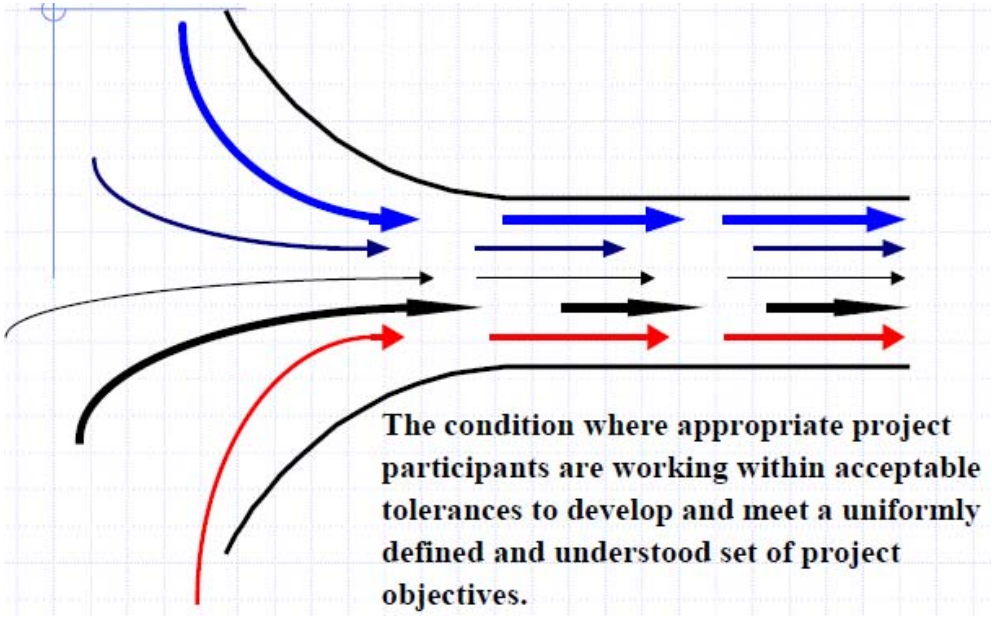
Construction Team Participants

- **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.**

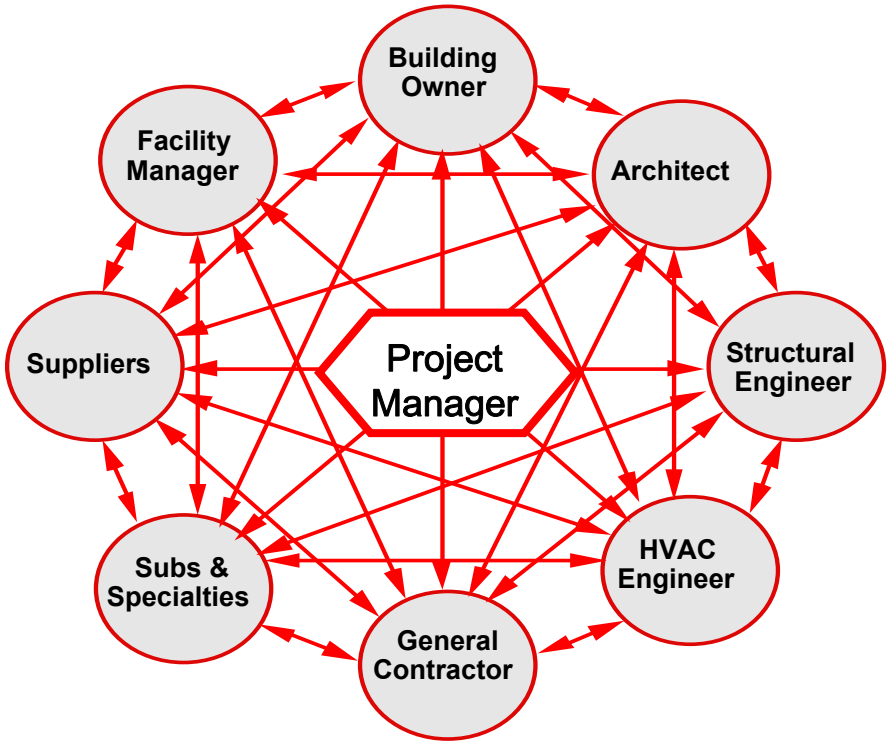
Team Leader Skills & Alignment

- **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?



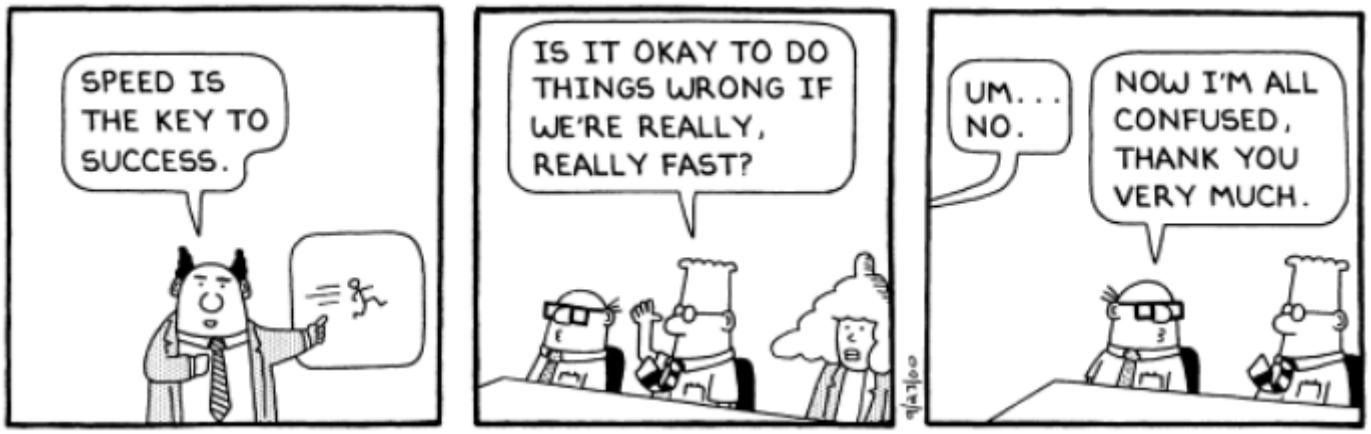
Teamwork Success Factor

- 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

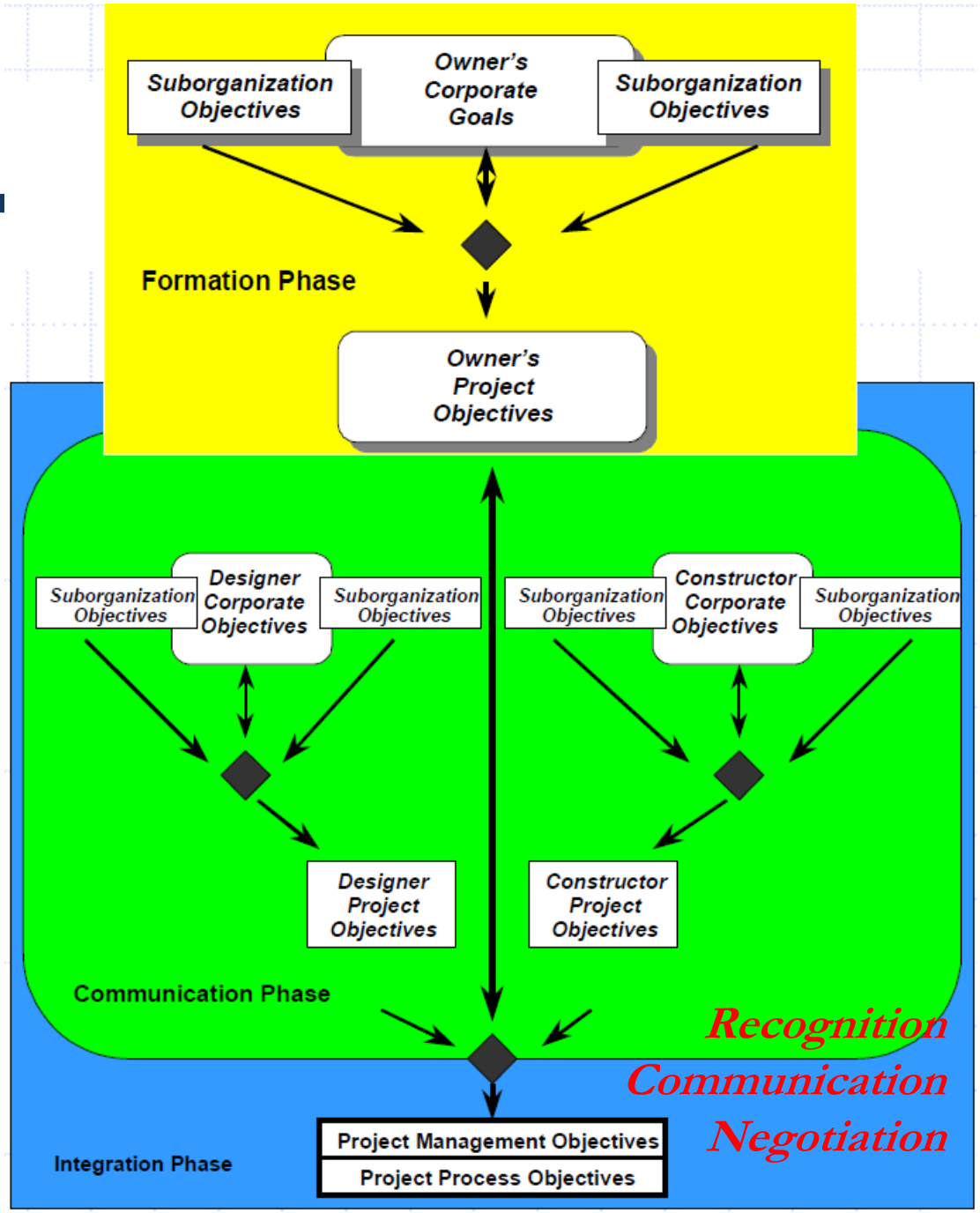
- **The Problem**
  - Different functional groups
  - Projects have complex objectives
  - Objectives often in direct conflict
  - Multiple decision makers
  - Change over time



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 Returned to Client	$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

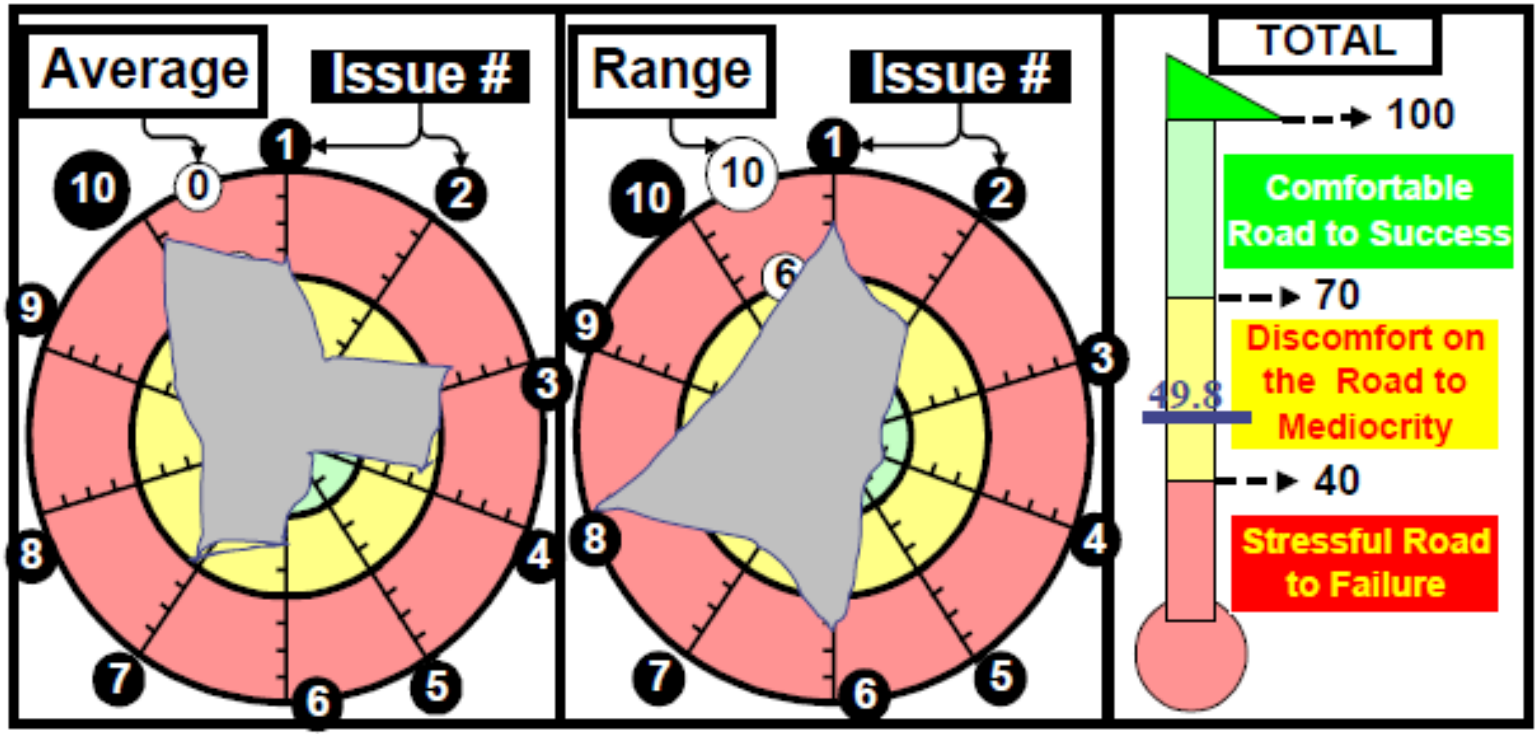
Alignment Checking

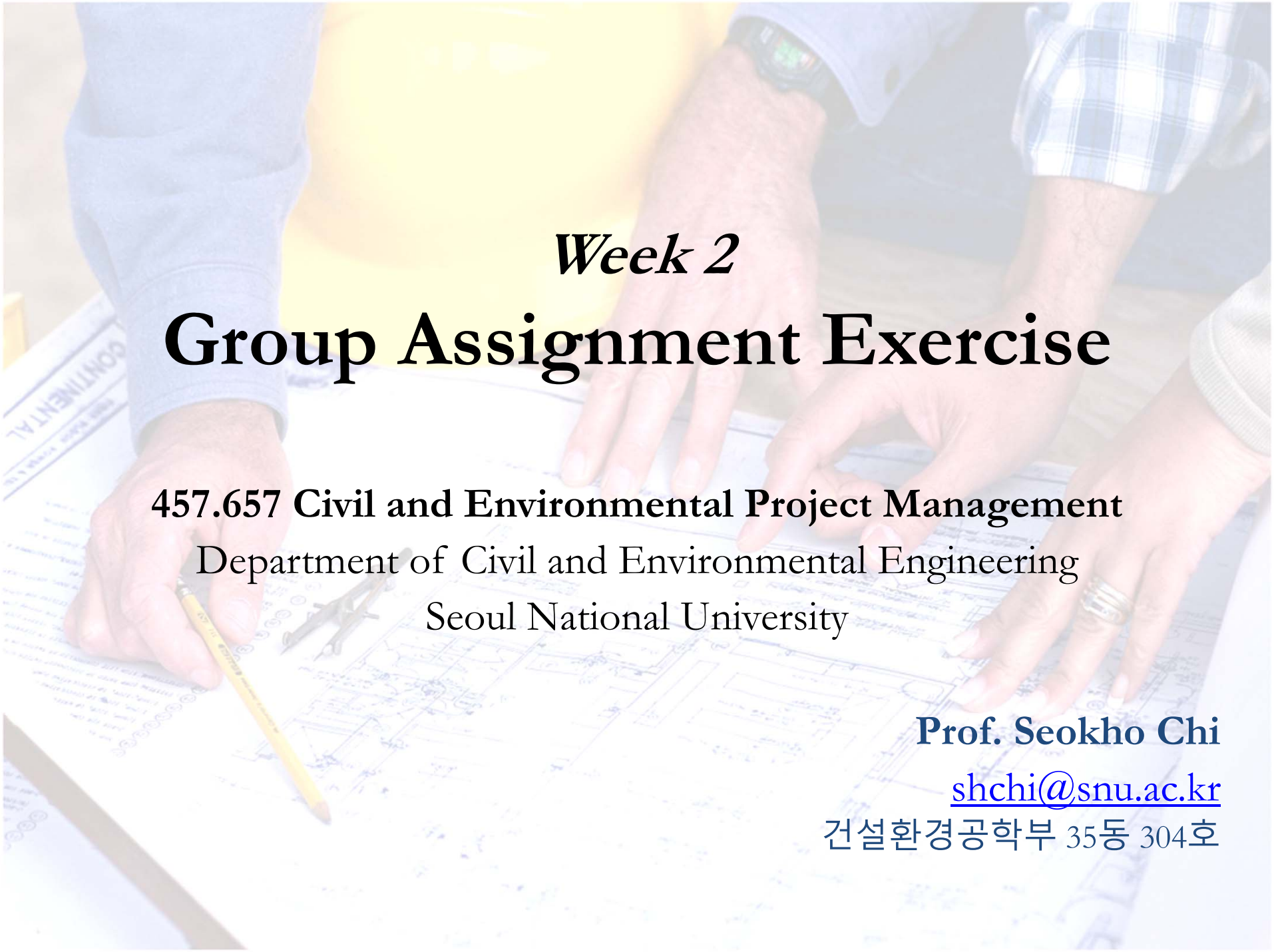
- Step 2

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





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Group Assignment Exercise

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Group Assignment Exercise

The U.S. Navy plans to design and construct two new recruit barracks to replace the old ones built between the years of 1958 and 1966, located at Naval Station Great Lakes, Illinois. This movement is a part of the RTC RECAP project, transforming Boot Camp from a deficient, facility-centric base into a state-of-the-art, training-centric environment. The entire project includes the development of the complete infrastructure (roads, sidewalks, utilities, storm drainage, elevated water tank, railroad underpass, landscaping, etc.) for a 48-acre parcel of land, adjacent to the existing RTC campus. Additional incidental related work must also be considered to provide a complete and useable facility. Each barrack will measure 16,700 square meters and will provide open bay housing for 1,100 recruits, classrooms, and advanced food service and dining facility. The total estimate cost is approximately $80 million including two barrack (each $30 million) facilities and green land development.

Group Assignment Exercise

- Form a group of 2 students
- Select a team name and logo

This is just an example. Your report should be more detailed!

Group Assignment Exercise

- **Project Scope Overview (General)**
  - A project management team for 457.657
  - Members from different regions
  - Having both functional and cross-functional management
  - Managing a project worth of U.S. $200 million
  - Prof. Chi is our lead sponsor

Group Assignment Exercise

- **Project Scope Overview (Project Specific)**
  - The project selected is the first phase of the multiple recruit barracks and infrastructure project, located at Great Lakes Naval Station, Illinois
  - Construction of two barracks facilities
  - Green field development of a 48-acre parcel of land
  - Cost: $200 million
  - Construction period from Oct. 2014 to Mar. 2016
  - World class facilities and quality

Group Assignment Exercise

- **Owner's Project Objectives**

Group Assignment Exercise

- Key Stakeholders