

Risk Management and Decision Analysis

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PART I

LIMITATIONS & FUTURE PERSPECTIVES

Risk Management: Trend

- Global Leading Companies

YIT Group > Investors > YIT as an investment > Risks and risk management

Investors

- YIT as an investment
 - Review by the President and CEO
 - Strategy
 - Operating environment
 - Risks and risk management**
 - Major short-term business risks and risk management
 - Internal control and risk management of financial reporting
 - YIT's most significant risks
 - Acquisitions and disposals
- YIT share
- Key figures
- Major shareholders
- Corporate Governance
- Financial position
- Reports and presentations
- Calendar
- Investor Relations
- Property investors

Risk management

YIT's risk management policy aims to identify major risk factors and optimally manage these factors so that the company achieves its strategic and financial objectives. The starting point is to manage the Group's total risk exposure, not merely the management of individual risk factors. Controlled risk-taking may have a favourable impact on the company's development, as changes impact our operations at different times and with different force.

Risks	Management methods
Strategic risks <ul style="list-style-type: none"> Changes in the operating environment Acquisitions Management of capital 	<ul style="list-style-type: none"> Balanced business structure Foreseeing, monitoring and analysis processes and ability to react Selection criteria, integration programmes, development of governance systems Balanced business structure Amount of investments and project start-ups
Operational risks <ul style="list-style-type: none"> Plot acquisitions Sales risk Contract tenders and service agreements Project management Personnel 	<ul style="list-style-type: none"> Analysis of plot-related terms and conditions and opportunities Contractual terms Adjustment of start-ups according to the sales volume Design management Contractual arrangements Tender and risk analyses Contractual expertise Competence of personnel and quality systems Decision-making authorities and regular auditing Monitoring of profitability Culture, work atmosphere, duties, training and career planning Ethical guidelines
Financial risks <ul style="list-style-type: none"> Sufficiency of financing Interest rate and currency risks Credit and counterparty risks Risks related to the reporting process 	<ul style="list-style-type: none"> Accounting and financing policies Internal and external audit
Event risks <ul style="list-style-type: none"> Accidents related to personal or data security or material damage to property 	<ul style="list-style-type: none"> Security policy Insurance policy and plans

Risk Management: Trend

- Global Leading Companies

Lemminkäinen

Other

HOME | COMPANY | BUSINESS SEGMENTS | INVESTORS | CAREERS | MEDIA | CONTACT INFORMATION

Lemminkäinen as an investment

Management and Corporate Governance

- » Group structure
- » Board of Directors
- » Group management
- » Remuneration
- » Auditing
- » Internal audit
- » Internal control
- » Risk management
- » Insider administration
- » Articles of association
- » General meeting of shareholders
- » Disclosure Policy
- » Silent period
- » CG Statements

Key financials

Credit facilities

Share information

Share tools

Owners

Releases and publications

IR Calendar

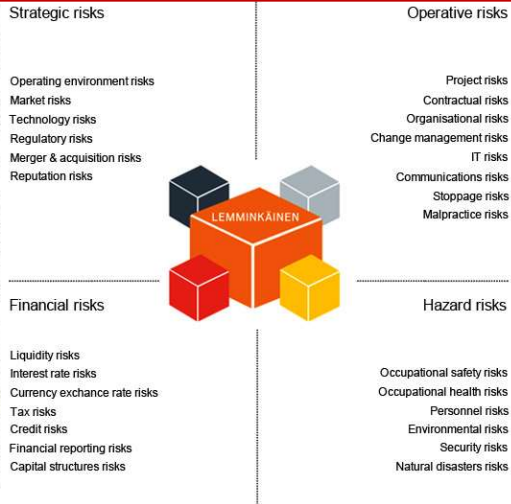
Investor relations

Property investors



Risk management

Risk management is a fundamental aspect of our business management. Our risk management seeks to increase shareholder value and ensure that we achieve our strategic and operative targets.



Risk Management: Trend

- Global Leading Companies

HOCHTIEF | Reports | Home | Contact | Imprint

Management Report > Risk Report
page 1 of 7

Risk Report

Risk management: A key success factor in our onward development

- Risk management as a foundation for sustained business achievement
- Group-wide early warning system for active risk control
- Risk situation further improved in reporting year
- No identifiable risks to HOCHTIEF's continued existence.

Integrated risk management

Risk management at HOCHTIEF takes in all organizational processes involved in advance detection of risks as well as in identifying and taking suitable action to counter them. A risk is defined as any contingency with a potential negative impact on the attainment of qualitative or quantitative business goals, and in particular on earnings.

HOCHTIEF deploys integrated planning, control and monitoring systems and fine-tunes them on an ongoing basis to ensure that risks are detected at a sufficiently early stage, assessed and appropriately managed.

Risk management is a key success factor for HOCHTIEF and, as such, forms an integral component of our management system. To promote risk awareness throughout the workforce, we nurture a continuously evolving risk culture at all levels. This risk culture is sustained by organizational processes, IT systems and open communication.

Unified early warning system throughout the HOCHTIEF Group

A Group-wide directive lays down standard procedures for risk management. The divisions supplement this directive with organizational instructions geared to their specific circumstances.

Overall risk

All risks are assigned an impact, probability, category, timescale and action to be taken. In complement to this quantitatively focused reporting, HOCHTIEF also attaches great importance to open discussion of risks by management. A key element of our early warning system is therefore a dedicated Risk Management Steering Committee made up of divisional and corporate center representatives. This panel looks at reported risks from the differing perspectives of the divisions and the holding company, allowing all material risks to be evaluated in an integrated framework. The Steering Committee also coordinates and adopts binding countermeasures.

HOCHTIEF compiles the Steering Committee's findings in a risk situation analysis. This details all major risks in tabular form. The commented analysis forms an integral part of reporting by the Controlling function and is finalized by the Executive Board. The Controlling function also reports on opportunities. There is no offsetting of risks and opportunities.

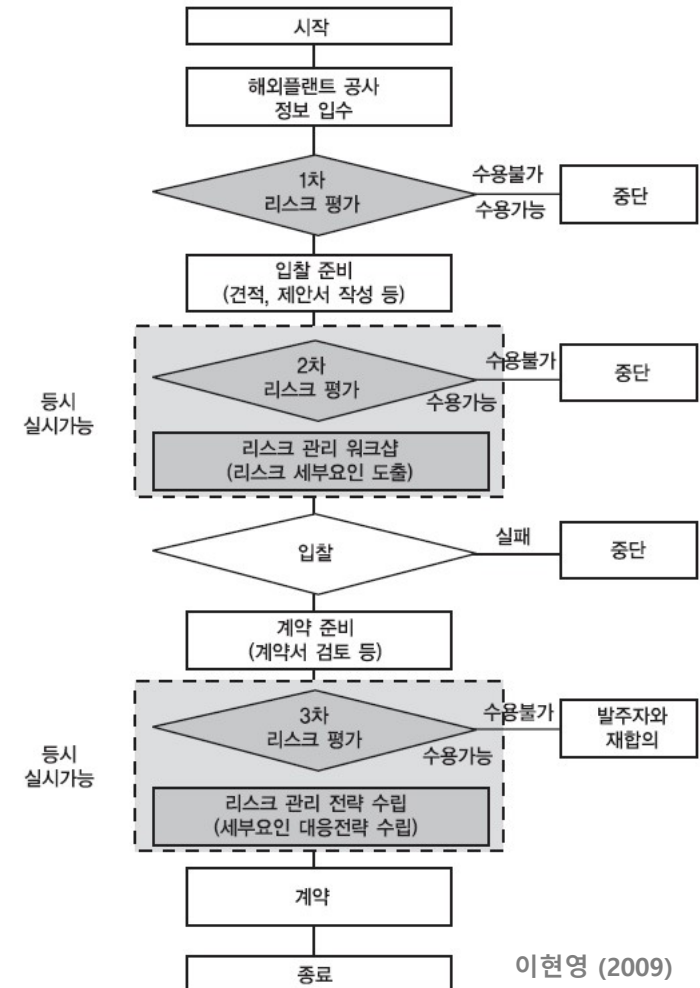
The company's annual average overall risk currently stands at approximately nine percent of pretax profit for 2006. This figure represents the sum of identified individual risks weighted by probability. In light of this analysis, there is no identifiable risk to the future results of operations, cash flows

Risk Management: Trend

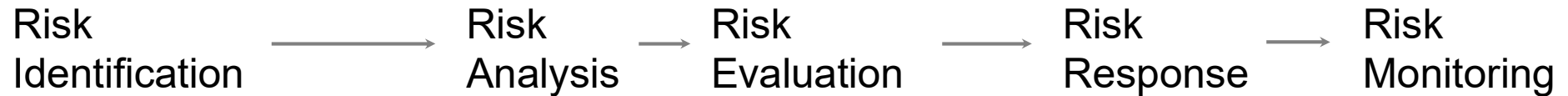
- Leading Korean Engineering & Construction Companies

구 분	A 기업	B 기업	C 기업	D 기업	E 기업	F 기업
조직보유 여부	사업부밖 별도조직	사업부밖 별도조직	사업부내 별도조직	사업부내 별도조직	사업부내 담당자	사업부내 담당자
의사결정시 권한	영업팀과 별도보고	영업팀과 별도보고	영업팀과 협의	영업팀의 의견종합	영업팀에 조언	영업팀에 조언
적용 공종	전공종	전공종	플랜트	플랜트	플랜트	플랜트
적용 단계	ITB이전 ITB이후 수행단계	ITB이전 ITB이후 수행단계	ITB이전 ITB이후 수행단계	ITB이전 ITB이후	ITB이후	ITB이전
적용 방법	리스크지수 산정후 전문가 판단에 의해 견적 반영	리스크지수 산정후 전문가 판단에 의해 견적 반영	리스크지수 산정후 과거공사비 비교뒤 예비비로 반영	응답안함	리스크 인자만 규명, 견적에 직접 반영하지는 않음	리스크 인자만 규명, 견적에 직접 반영하지는 않음

한승헌 (2009)



Literatures on Risk Management



Baker et al. (1999)

Risk identification

Arditi & Gutierrez (1991)
Kangari & Lucas (1997)
Gunhan & Arditi (2005)
Han et al. (2007)

Political risks

Ashley & Bonner (1987)

Cultural distance

Wang et al. (1999)
Chan & Tse (2003)

Exchange rate risks

Demacopoulos (1989)

Risk quantification: Probability x Impact

Zhi (1995)
Baccarini & Archer (2001)
CII (2003)

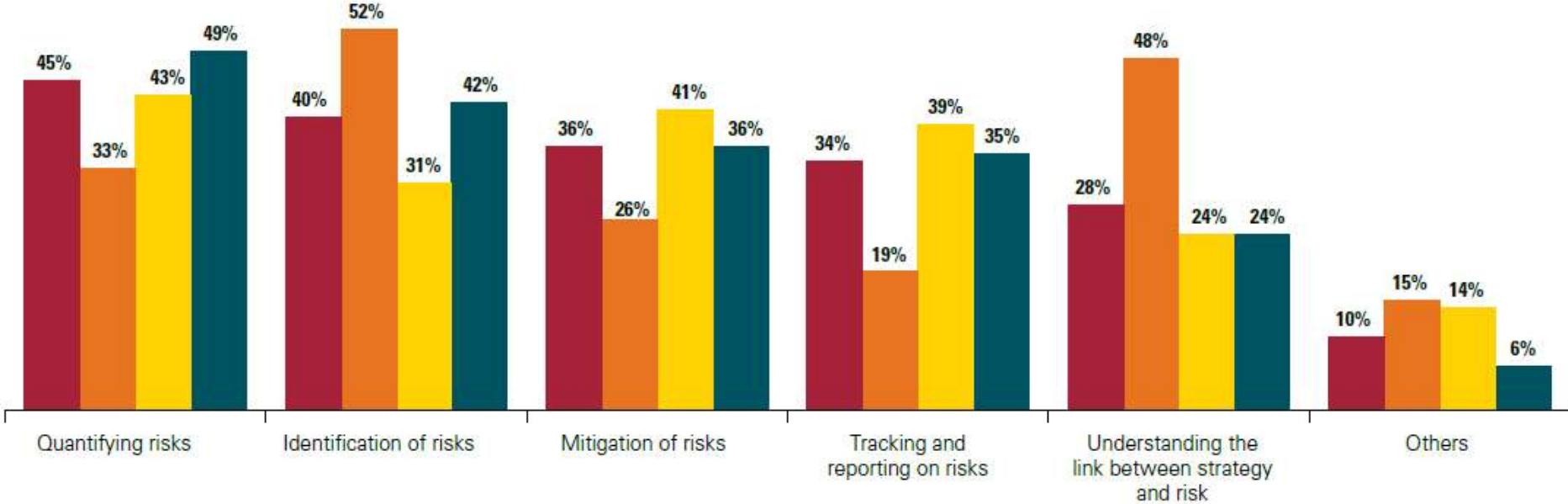
Jannadi & Almishari (2003)
Kim (2005)
Han et al. (2008)

Risk Management System

Kangari & Lucas (1997)
del Cano & del la Cruz (2002)
CII (2003)
Han et al. (2008)

Difficulty in Risk Management

1. Lack of Risk Management Professionals



● Overall (n=161)
 ● Americas (n=27*)
● ASPAC (n=49)
 ● EMEA (n=85)

*Yes' percentages represented
 *Low base – findings are directional in nature
 Respondents chose two greatest challenges.
 Source: KPMG International, 2011

Difficulty in Risk Management

1. Lack of Risk Management Professionals

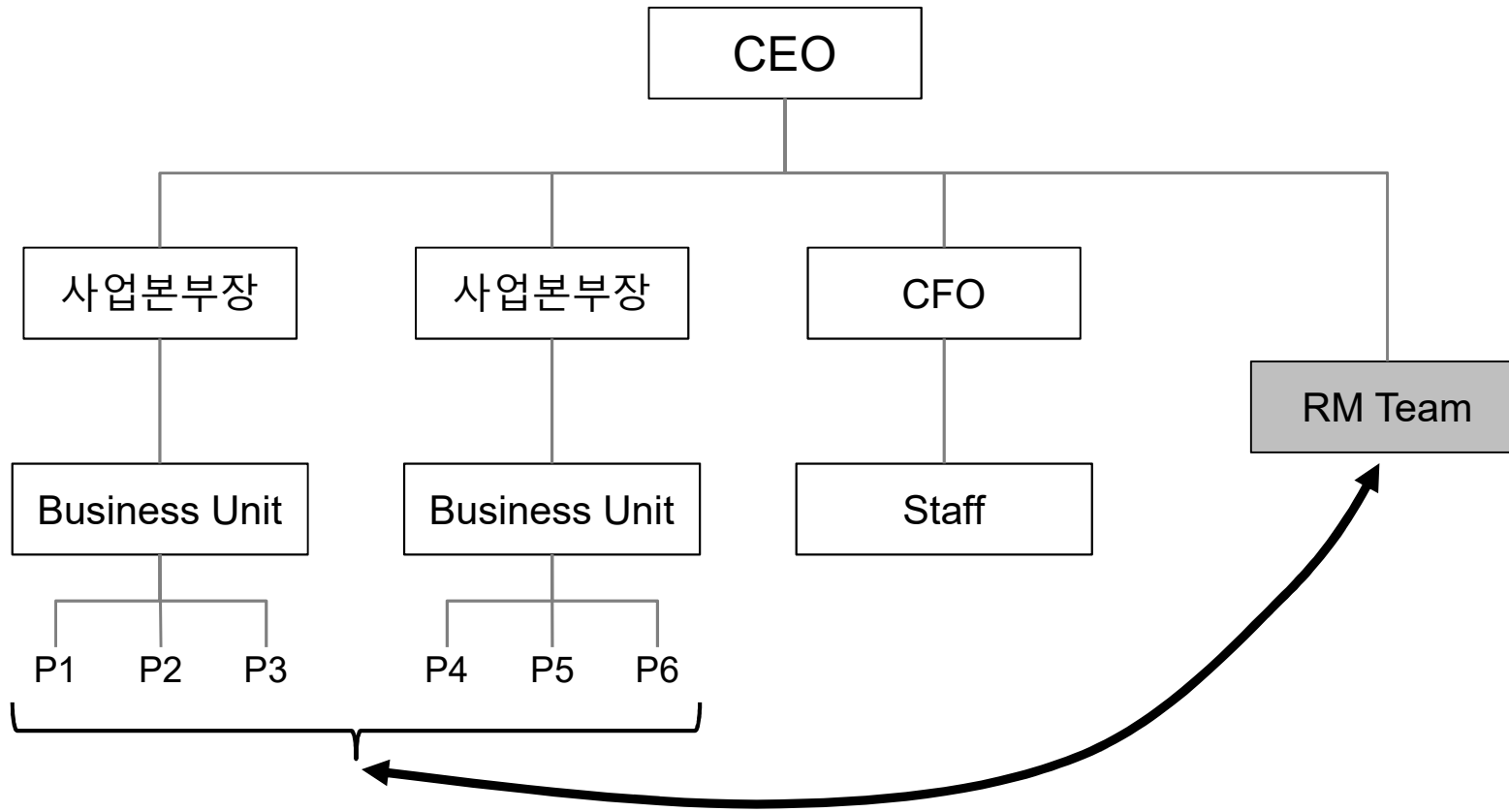
Risk Assessment Sheet - SECTION II – COUNTRY												
CATEGORY	NA	Likelihood of Occurrence (L)					Relative Impact (I)					
		Very Low		Very High			Negligible			Extreme		
		1	2	3	4	5	A	B	C	D	E	
리스크 요인 예 ↓												
II.A. TAX/TARIFF												
II.A1. Tariffs/duties												
II.A2. Value added tax												
II.A3. Legal entity establishment												
II.A4. Application of tax laws and potential changes												
II.A5. Technology tax												
II.A6. Personal income tax												
II.A7. Corporate income tax												
II.A8. Miscellaneous taxes												
II.B. POLITICAL												
II.B1. Expropriation and nationalism												
II.B2. Political stability												
II.B3. Social unrest/violence												
II.B4. Repudiation												
II.B5. Government participation and control												
II.B6. Relationship with government/owner												
II.B7. Intellectual property												

제시된 요인들의 개념이 매우 광범위하기 때문에 발생확률을 추정하기 위한 기준이 모호함

리스크 수준이 높은 구체적인 원인 및 관리 대상(targets)을 규명·선별해 내기 어려움

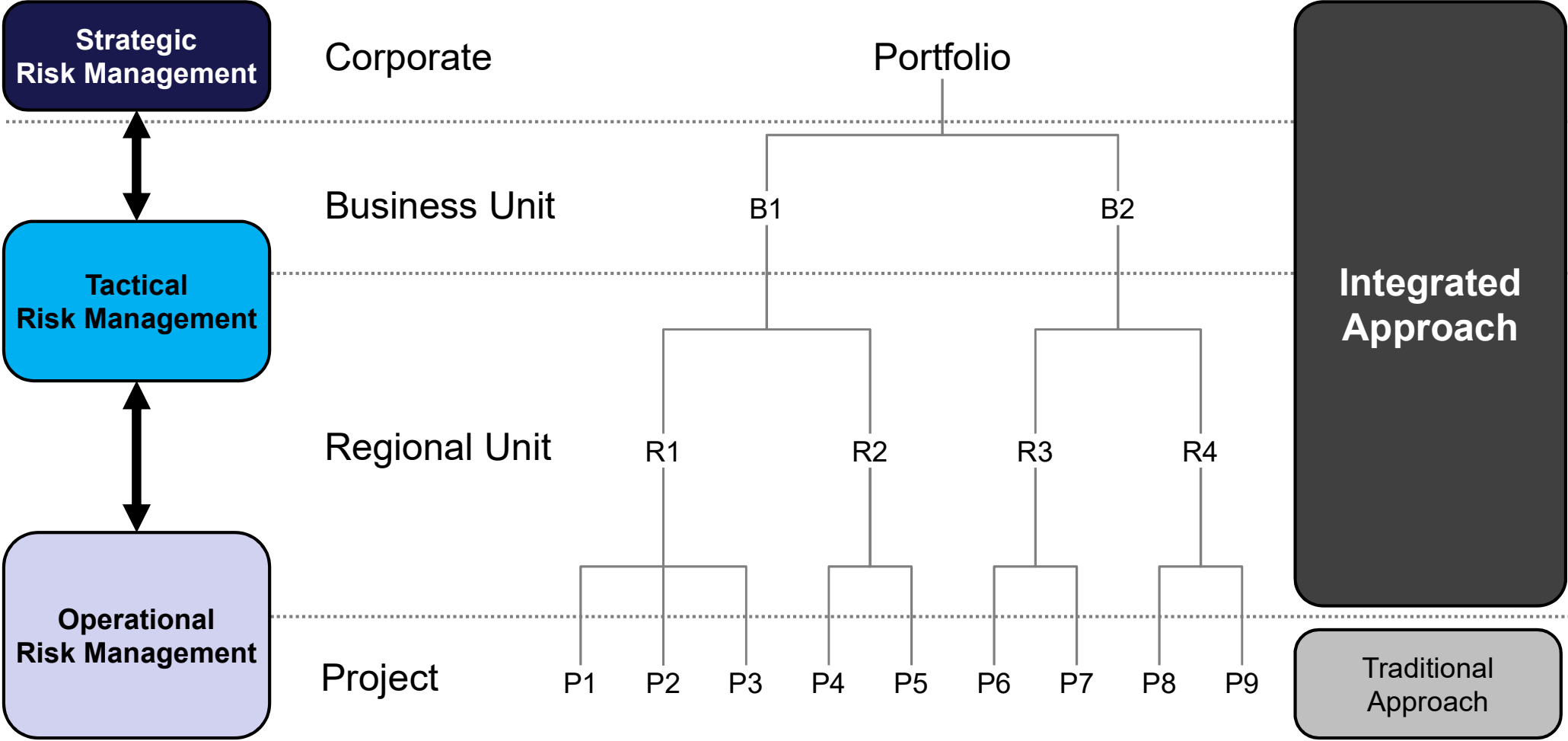
Difficulty in Risk Management

2. Organizational Issues related to Risk Management Team



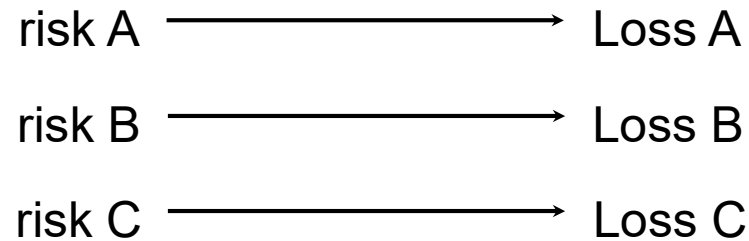
Difficulty in Risk Management

3. Need of Corporate Level Risk Management

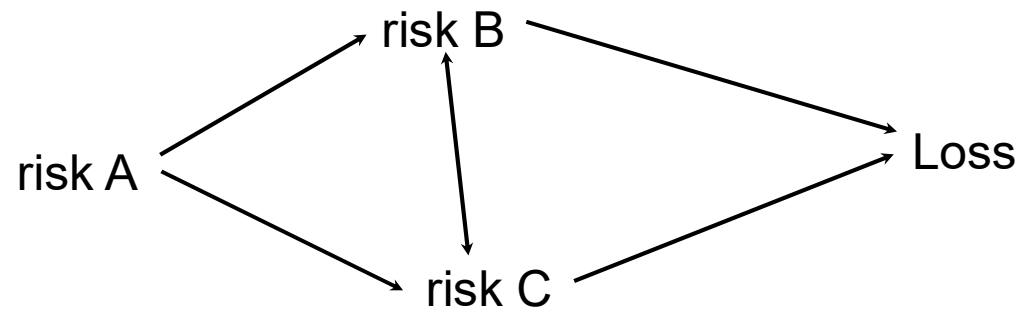


Limitations of Traditional Approach

1. Interrelation problem



[Prior assumption of Independence between risks]



[Network structure of risk effects]

Limitations of Traditional Approach

2. Overall risk of project

risk	probability (likelihood)	Impact (consequence)	risk level (importance)
risk A	5	5	25
risk B	5	4	20
risk C	4	5	20
risk D	4	4	16
...
...
...
...

**Summation of risk level
= Overall risk of project?**

Limitations of Traditional Approach

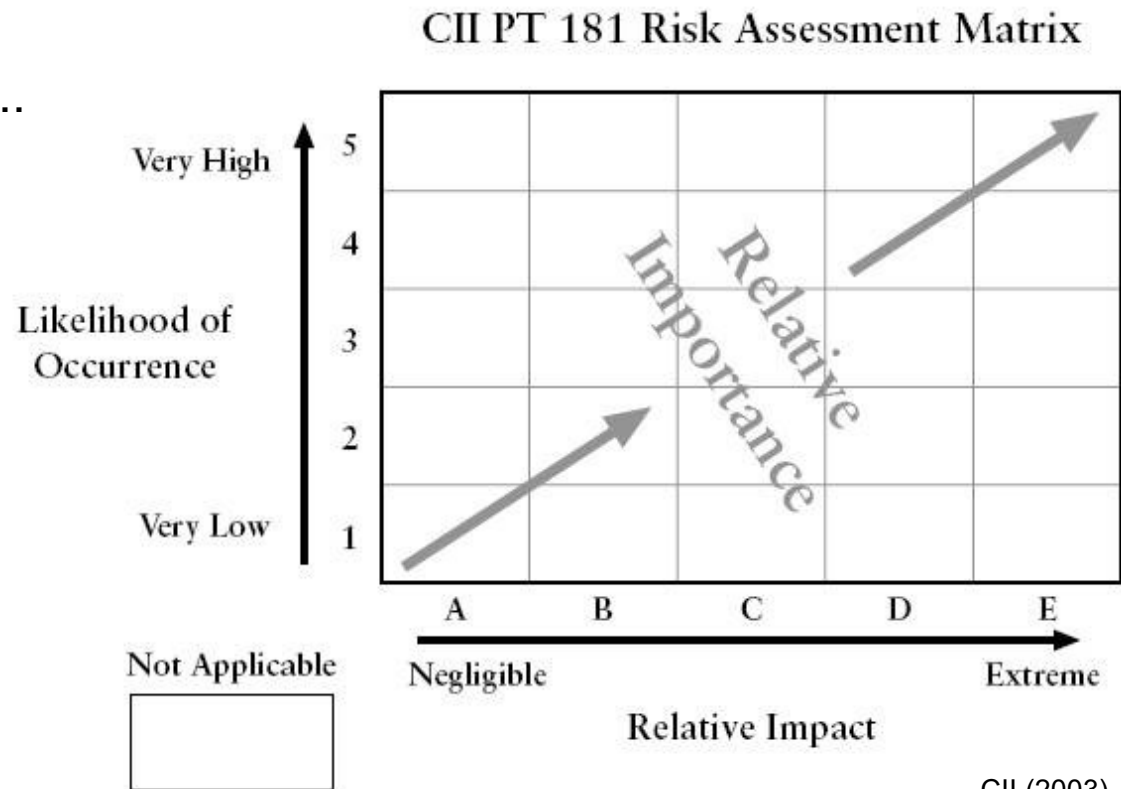
3. Risk quantification problem

1) Ambiguity of risk probability

: probability, frequency, likelihood, ...

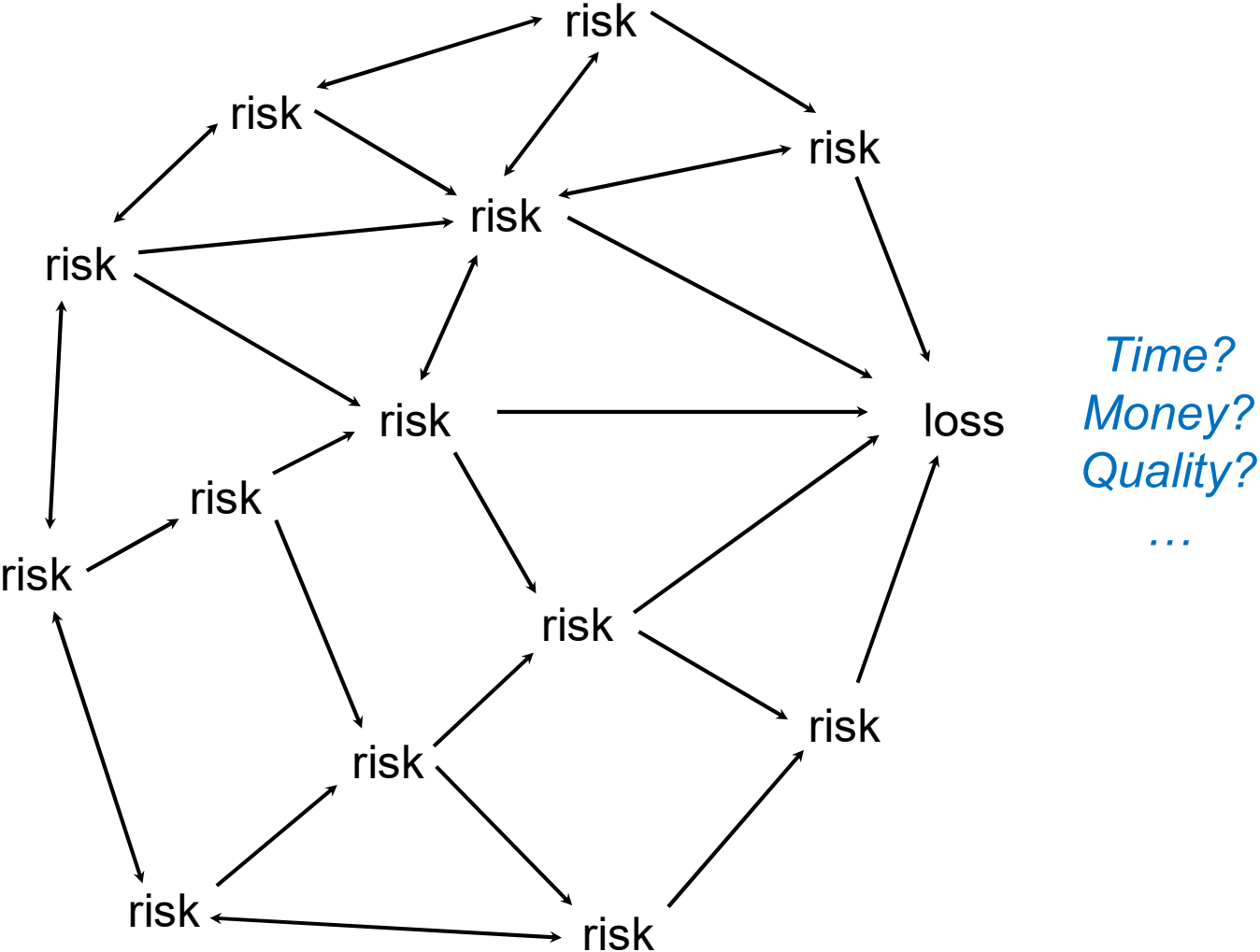
- Time-horizon
- Continuing risks

• Difficulty of Measurement



CII (2003)

International Construction Project Risks



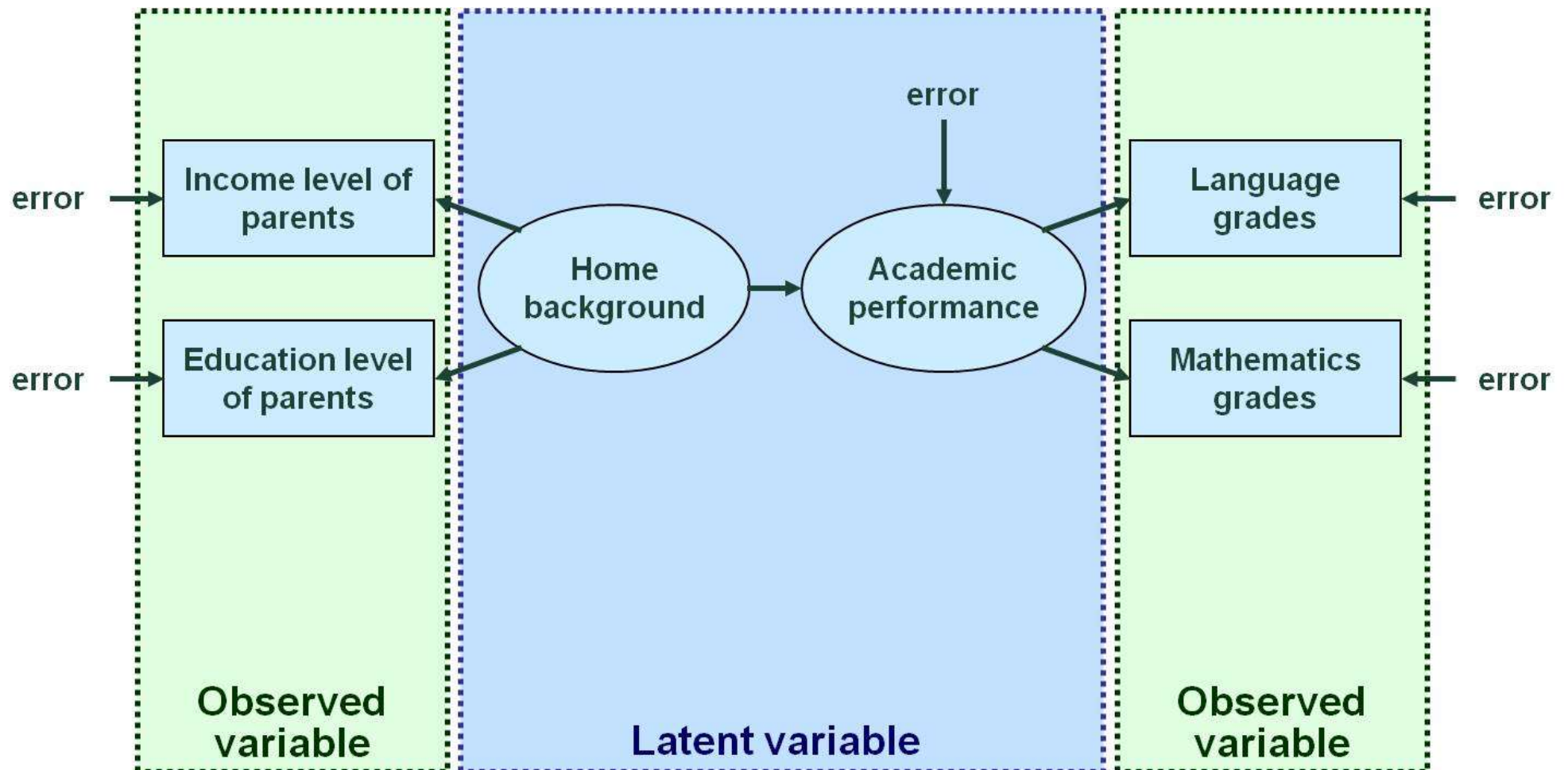
International Construction Project Risks

- **Structural Equation Modeling (SEM)** ‘회귀분석보다 변수간의 관계가 복잡’ + ‘종속변수 多’ 때 활용
 - is a statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions
 - is a systematic combination of confirmatory factor analysis(요인분석), multiple regression analysis(회귀분석), and path analysis(경로분석).
 - has the ability to construct **latent variable**(직접 측정할 수 없는 잠재변수): variables which are not measured directly, but are estimated in the model from several measured variables each of which is predicted to 'tap into' the latent variables.

International Construction Project Risks

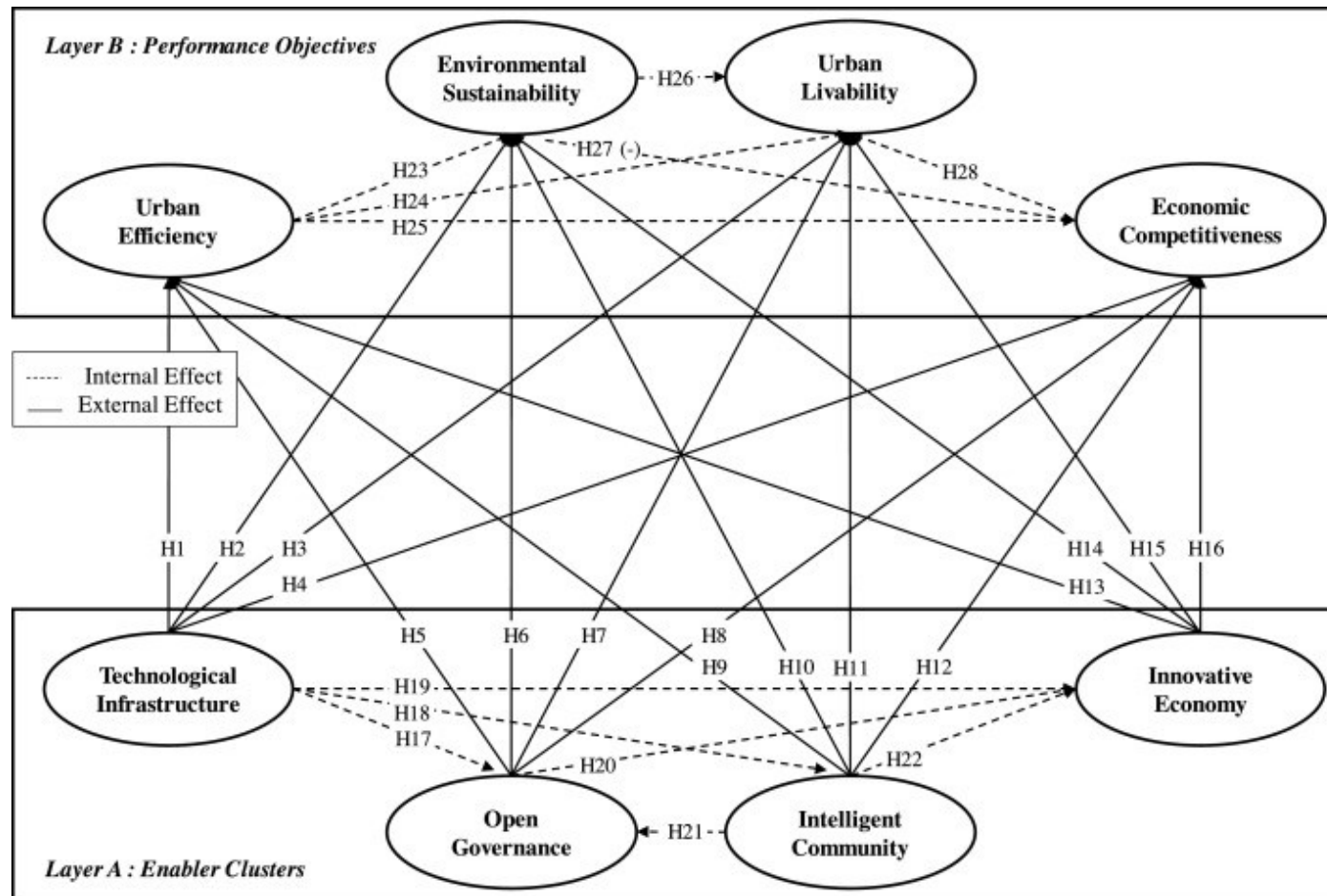
- Structural Equation Modeling (SEM)

Kim et al. (2008)



Quantifying the dynamic effects of smart city development enablers using structural equation modeling

Clément Nicolas ^a, Jinwoo Kim ^{a, b}, Seokho Chi ^{a, b}

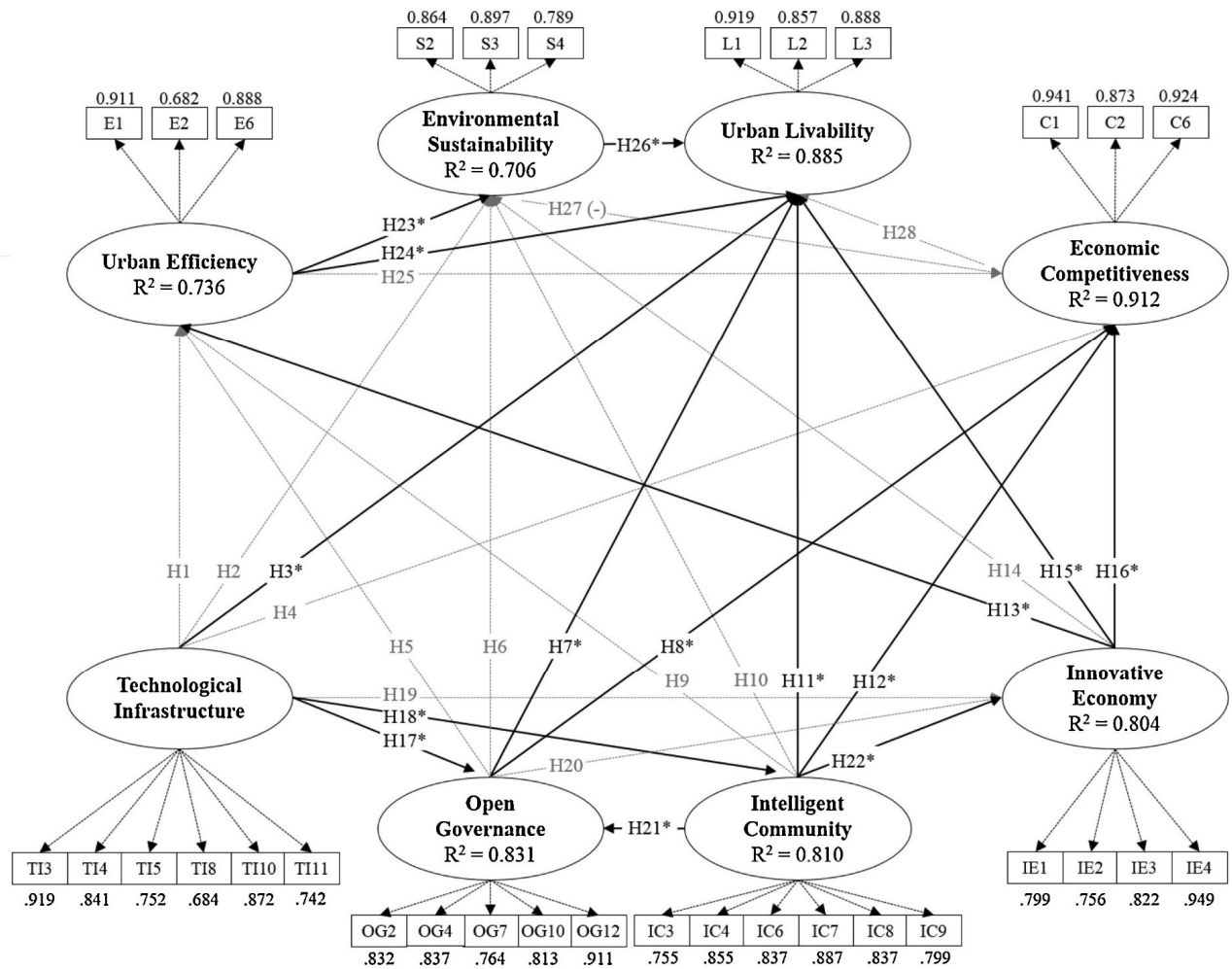


Intelligent Community (IC)

11	Eco Consciousness	IC1	Water per capita
		IC2	Electricity Per Capita
		*IC3	Energy Savings
12	Education	*IC4	Affinity for Studies
		IC5	Students' Abilities
13	Creativity	*IC6	Creative Ideas (Start-ups)
		*IC7	Scientific Creativity
14	Digital Proficiency	*IC8	Digital Skills
		*IC9	Cyber-Vigilance
15	Social Cohesion	IC10	Social Equality
		IC11	Ethnic Diversity
		IC12	Elderly People

Urban Efficiency (E)

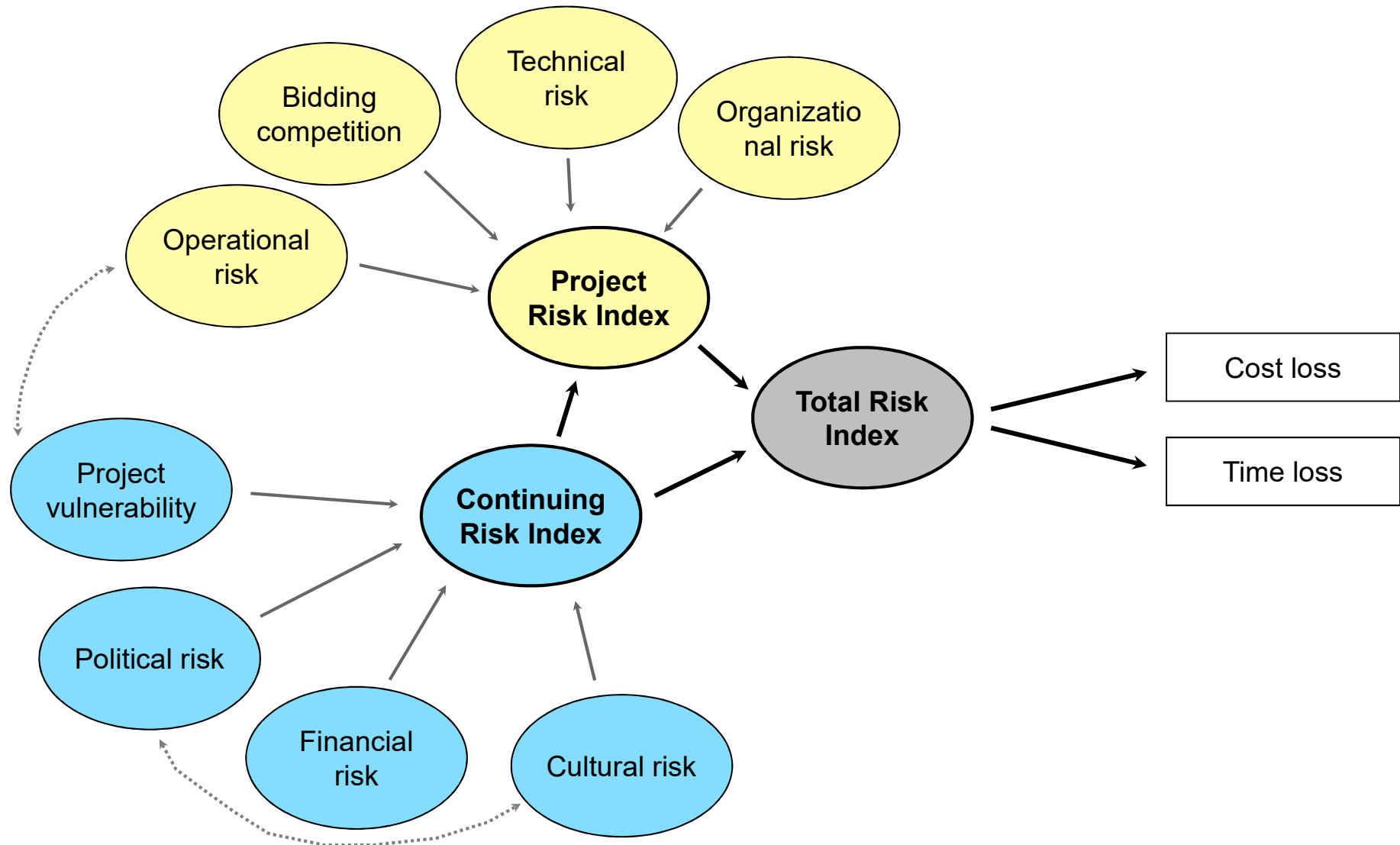
*E1	Smart Parking
*E2	Car Sharing Services
E3	Public Transport Reliability
E4	Utilization of Public Transport
E5	Traffic Flow
*E6	Traffic Safety



* : Significant path coefficients (p - value < 0.1)

Total Risk Index (TRI) Model for International Construction Projects

- Structural Equation Modeling (SEM): Analysis Model



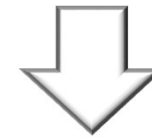
리스크 평가점수 채점방식 객관화

해외사업 리스크 체크리스트 (화력)			
[평가점수 : 양호 0, 보통 2, 불량 10]			
구분	위험 평가항목	가중치	평가 점수
국가위험	▪ 국가신용등급	1	
	▪ 태환 및 송금	2	
	▪ 물수	2	
	▪ 법률 변경	4	
	소요	2	
	법적위험	4	
	환율위험	4	
	재원조달 및 이자율	4	
	불가항력 및 보험	4	
	약해지 보상가	2	
사업위험	▪ 사업비 초과	4	
	▪ 공기지연	4	
	▪ 제3자 위험	4	
	▪ 성능 미달	4	
	▪ 기술 위험	1	
	▪ O&M 업체의 역량	1	
	▪ 운영비용 초과위험	2	
	▪ 보수	1	
	▪ 전력구매자 신용도	4	
	▪ 매출 위험	4	
▪ 연료 위험	4		
사업주 위험	▪ 사업 수행조직의 역량/전문성 및 자문사의 활용정도	2	
	▪ 컨소시엄 파트너 역량	2	
	▪ 이종과세의 경감	4	

기존 (As-Is)

단순 착안사항 주관식 질문

Q. 차입금과 관련, 변동금리를 고정금리로 스왑(swap)하는 등 대처방안이 적절하게 마련되었는가?
(양호 0점, 보통 2점, 불량 10점)



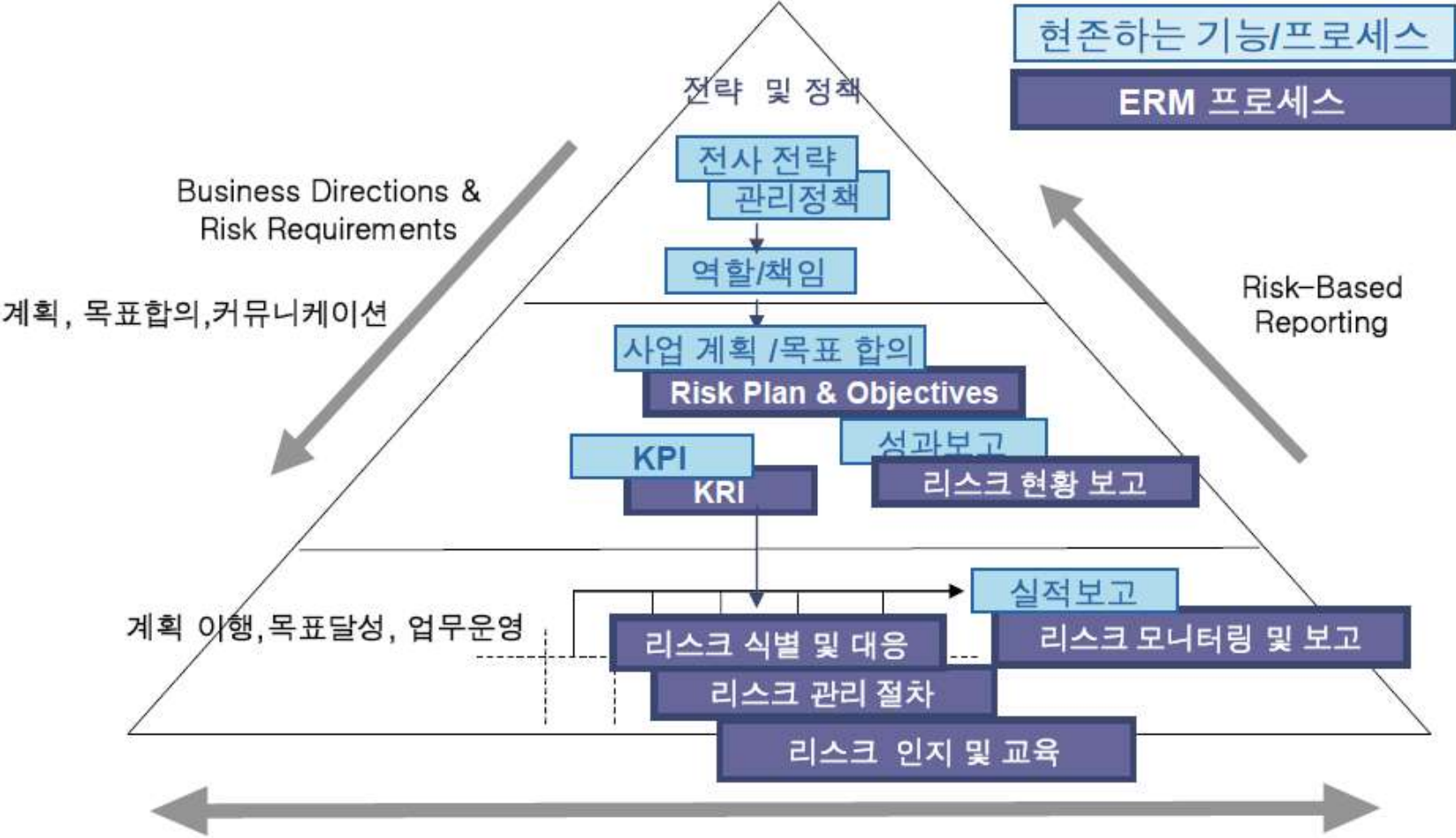
개선 (To-Be)

계량화된 객관식 질문

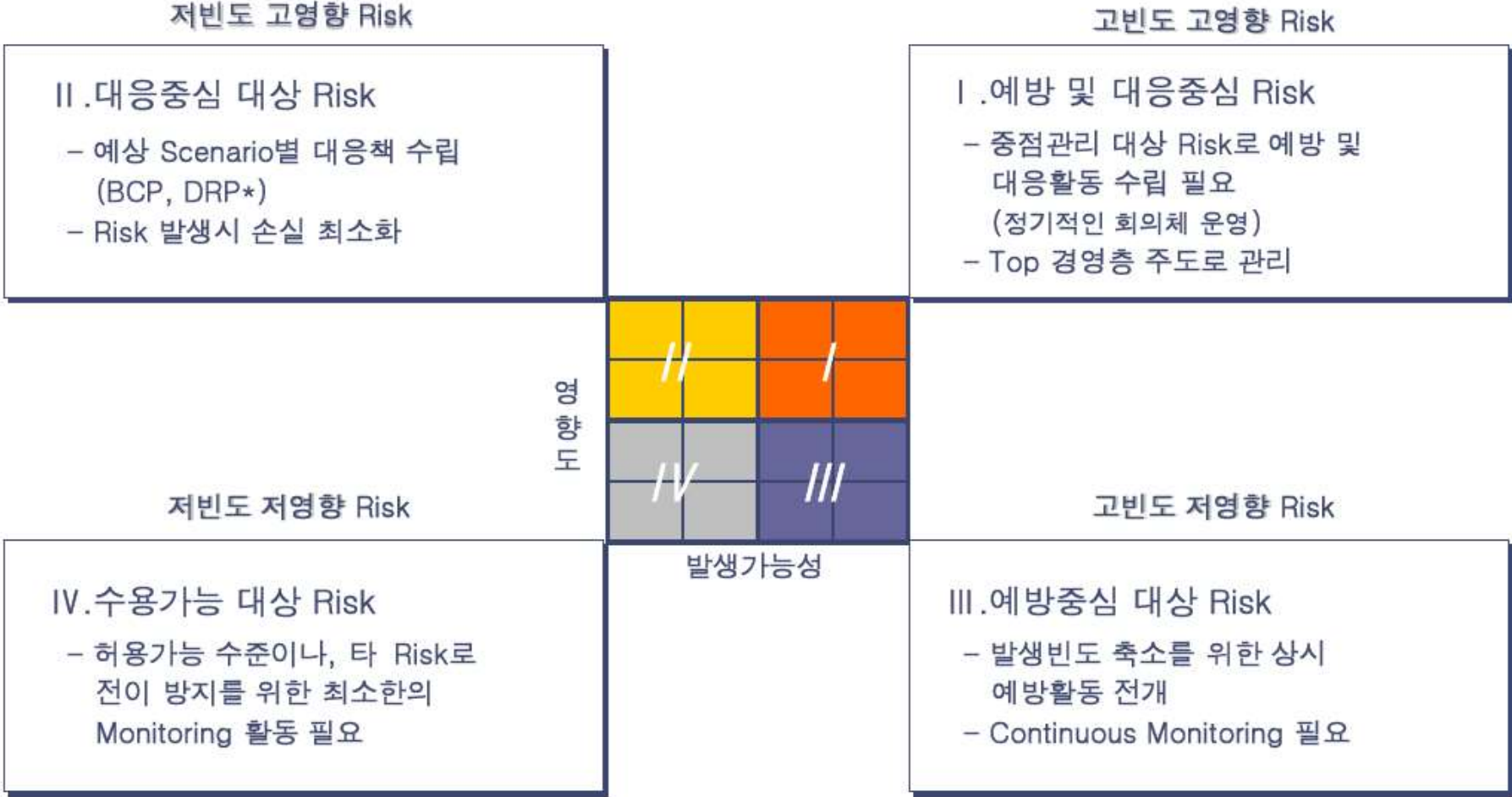
Q. 재원조달 조건상 이자율 위험이 존재하는가? 존재한다면 경감방안이 마련되어 있는가?

- 1) 이자율 위험이 없음. 또는 이자율 스왑 등 경감방안 시행후 변동금리부 대출 비중이 50% 이하 0점
- 2) 이자율 스왑 등 경감방안 시행후 변동금리부 대출 비중이 50% 초과 80% 이하임 2점
- 3) 이자율 스왑 등 경감방안 시행후 변동금리부 대출 비중이 80%를 초과함 4점

Future Perspectives



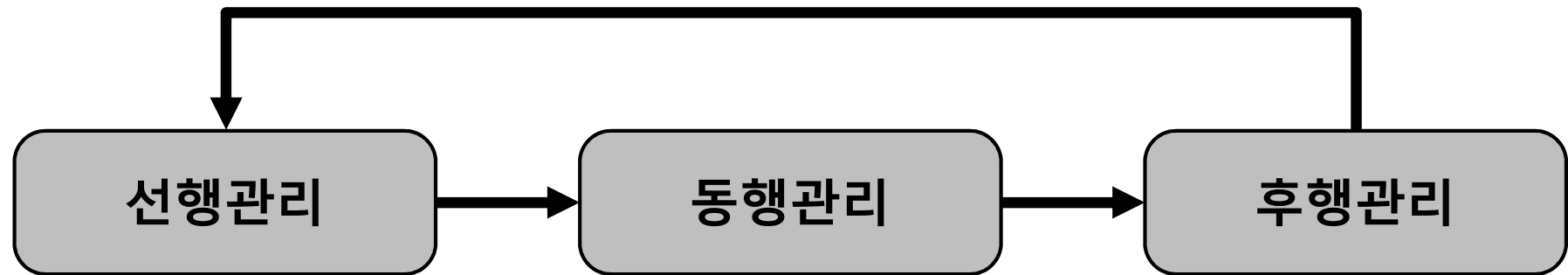
Future Perspectives



* BCP (Business Contingency Plan), DRP (Disaster Recovery Plan)

Future Perspectives

- 장기적 비전에 의한 [과거-현재-미래]의 3차원적 리스크 관리 체계



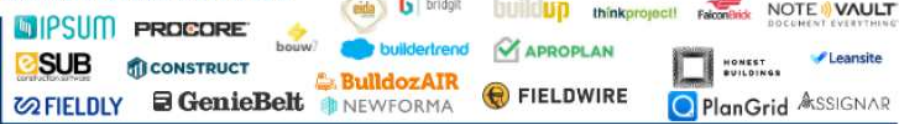
- 조기경보시스템(Early-Warning System) 기반 의사결정 지원체계

- 전사차원의 실시간 리스크 수준 관리체계

- 사후 모니터링
- 리스크 관리 지식의 축적

Future Perspectives

Collaboration Software



Bid Mgmt



Equipment Share



Financial Management



Drones



Marketplace



AR/VR



Offsite



Robots



Design Technologies



3D Printing



Security & Compliance



Monitoring & Safety



Data & Analytics



PART II

Closing

Risk Management & Decision Analysis

- Decision under risky situation, every where – any time!
- Risk is an integral part of decision making.
- Modeling required for analyzing decision components quantitatively.
- Selecting an appropriate modeling tool is dependent on the decision goals, decision feature, and its specific situation.
- Some individuals often under-estimate or over-estimate – attempt to avoid biases!
- Beyond the modeling capability, look at human's creativity – decision tools are just supportive for human.

Risk Management & Decision Analysis

- “Post-mortem(사후분석)” historical data is important in risk and decision analysis.
- Risk management strategy focuses on corrective action.
 - Crisis management plan: focus on survival
 - Recovery actions: focus on “catch up”
 - Corrective actions: focus on causes & future prevention
- Big trend is developing hybrid models.
 - Combining risk/decision tools with optimization approach
 - Bayesian model with MC simulation
 - Influence diagram and fuzzy set theory
 - Integrating scientific model and human’s creativity...

Street Calculus

Q & A

