Information Technology Investment: Decision Making Methodology

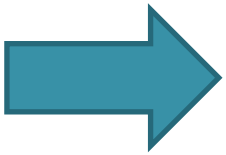
Chapter 3

Measuring Information Technology Performance

Prologue

Investments in IT **have to be justified**,
or else organizations would not invest in IT

- Conventional IT Metrics
  : Availability, Response Time, Throughput, …
- Suggested IT Metrics
  : Profit, Cost, Customer Experience, …



Expressed as Perceived Values

I. Introduction

To evaluate an investment it must be measured in some way for comparison

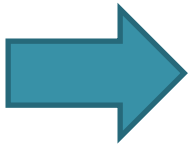
This chapter is focused on introducing a variety of measures for the evaluation of IT investments

II. The Economics of Information

Economics of Information

: a systematic series of concepts and theories that explain the role which information and IT play to assist an organization

The economics of information presents rules with which to assess the expected and actual impact of investing in a particular IT



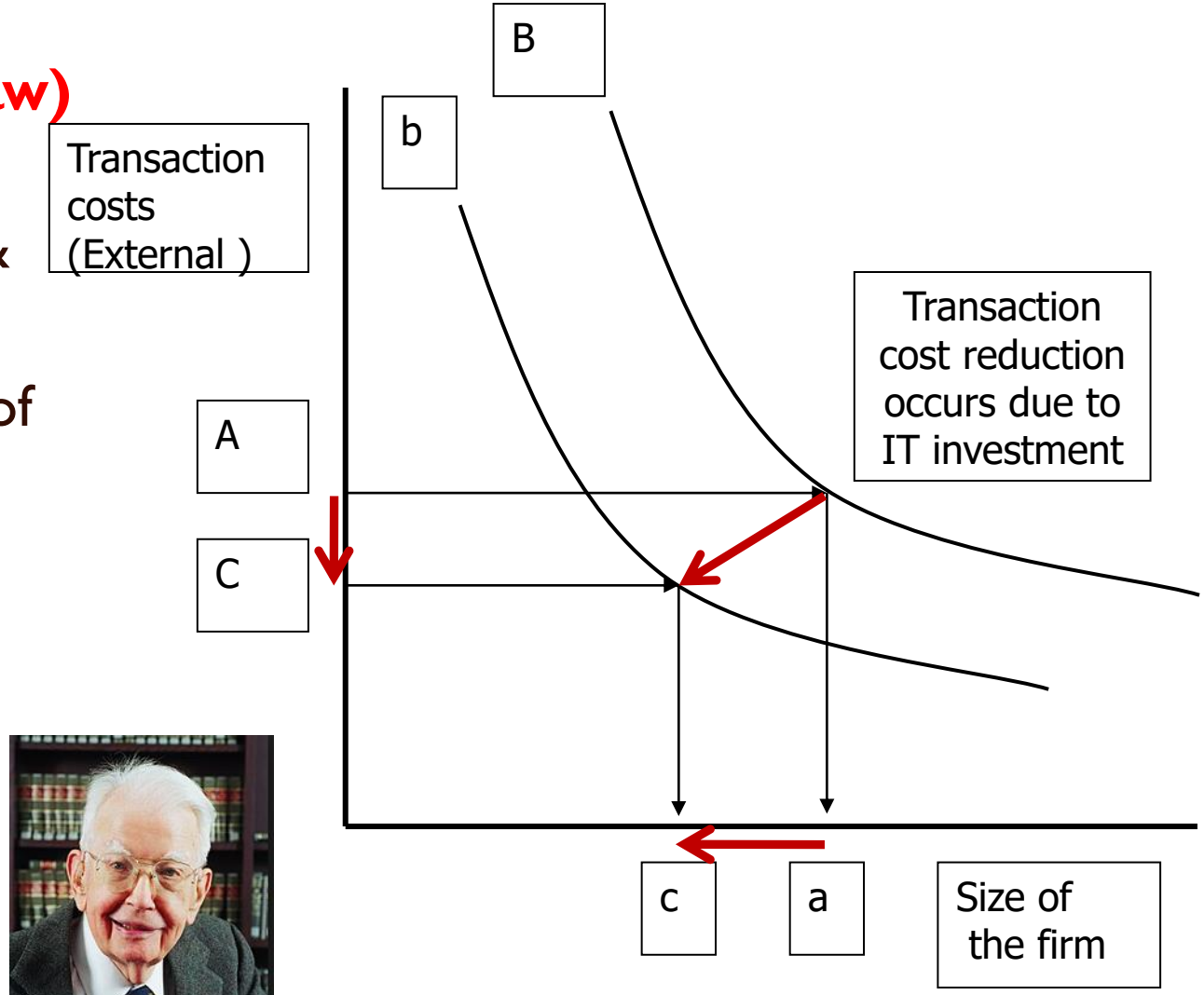
Hard to find out single rule to actually assist every IT evaluation

II. Examples of the Economics of Information

Transaction cost theory (Coase's Law)

: To economize on transaction(internal & external) costs

: Explains the origin of firms

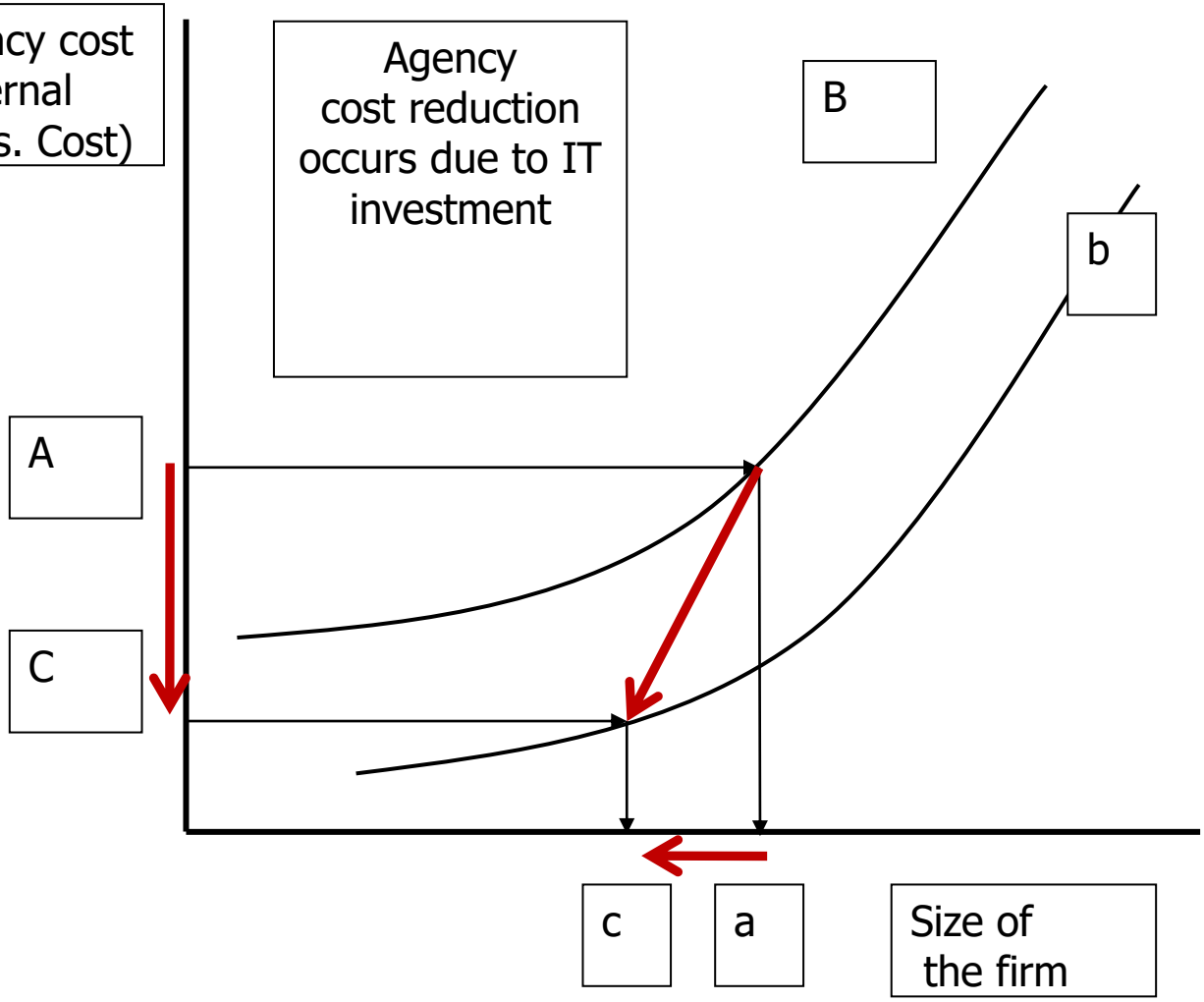


II. Examples of the Economics of Information

Agency theory I

: As firms grow in size, the owners have to increase its employees who act as agents.

: By investing in IT, less agents are required to manage the firm.



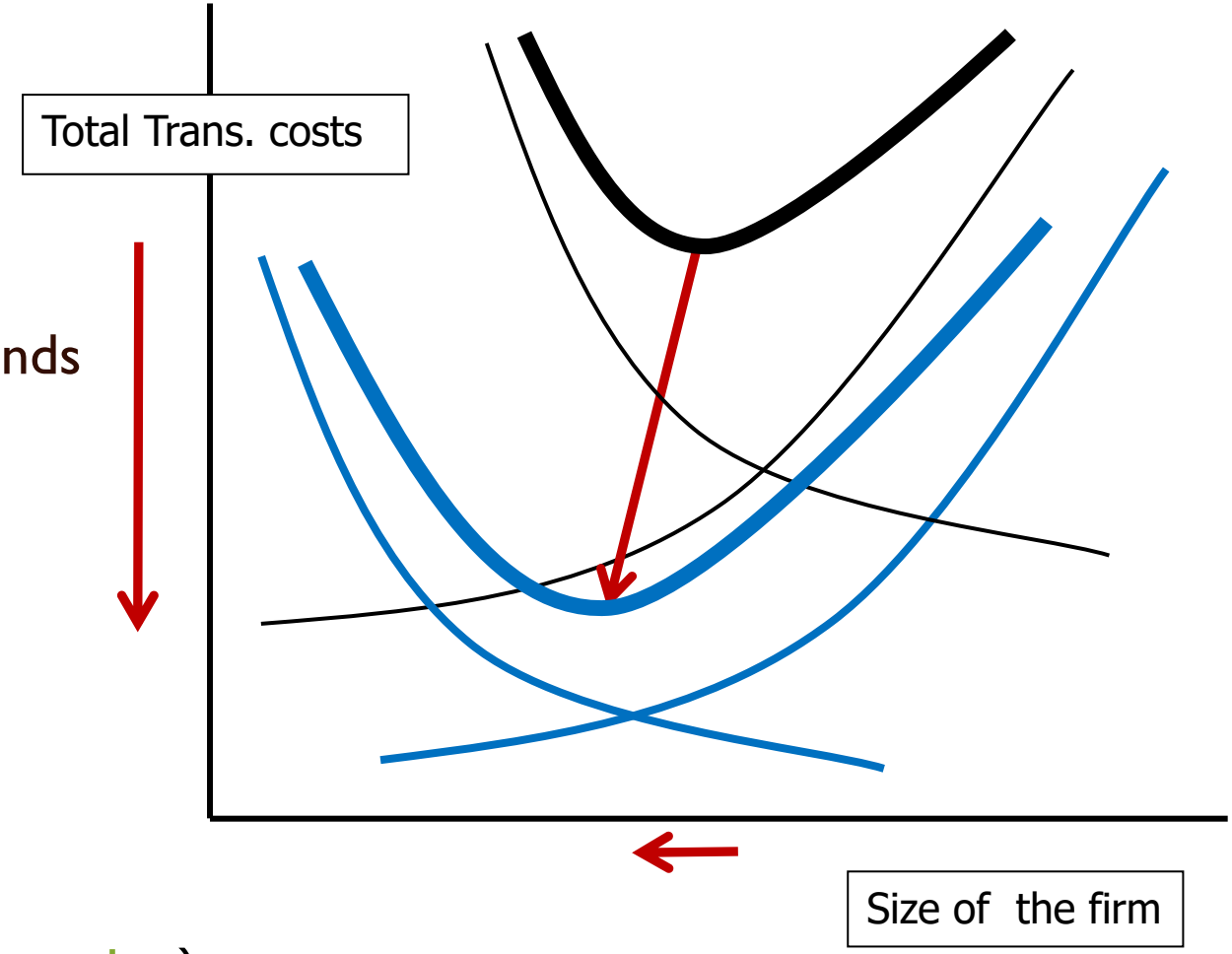
A reduction in the agency costs from B to b, reduces the size of the firm from a to c

II. Examples of the Economics of Information

Transaction cost theory + Agency theory

- Digital economy tends to expedite downsizing of the firms
- Unemployment Crisis !!!
- Apple vs. Samsung

(Outsourcing vs. Insourcing)



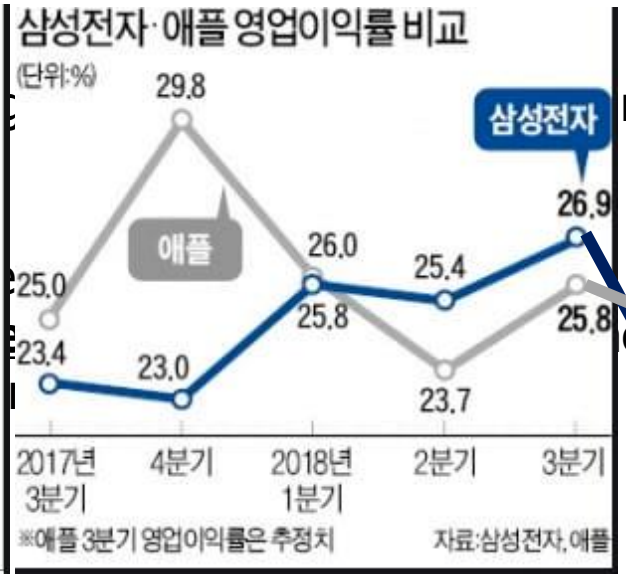
II. Examples of the Economics of Information

- **Agency theory II**
  - ✓ Principal is too busy to do a given job and so hires the Agent.
  - ✓ Being too busy also means that the Principal cannot monitor the Agent perfectly.
  - ✓ There are a number of ways that the Principal might then try to motivate the Agent: incentive contracts (similar to profit sharing or sharecropping), timing, payoff, and so on.

By investing in IT, these could be resolved !!!

II. Examples of the Economics of Information

- **Economies of scale**
  - ✓ **Production** : Technology of production is increasingly cost-effective as the scale grows
  - ✓ **Information** : Information is not consumed by use, and can be used cost-effectively for larger scale of operation
  - ✓ **Network externalities** : It becomes dominant as it increases market share or geographical scope



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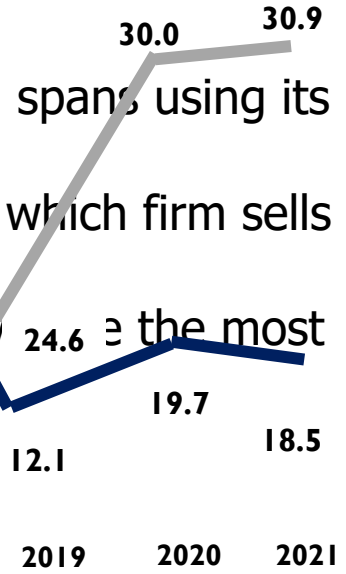


II. Examples of the Economics of Information

- **Roles of Information Systems in Organization**
  - ✓ **Operation** : IT increases scale and scope efficiencies of the firm's operation
  - ✓ **Transaction Processing** : IT processes basic business transactions
  - ✓ **Monitoring/Performance**: IT monitors, records, and evaluates performance of employees and their functions
  - ✓ **Documentation/Communication**: IT maintains records of status and change in the fundamental business functions within the organization
  - ✓ **Decision Support**: IT collects and provides information relevant to managerial decisions

IT can lead to more centralized management, more decentralized divisions, therefore, hybrid organizational structures

However, net effect may vary case by case !!!

III. Why Measure IT Performance?

ANSWER: Simply, to evaluate the functioning of an IT investment. To assess the business value, the efficiency, and effectiveness of an IT

→ No Improvement Without Measurement

Other reasons…

- To fully understand the impact of IT investment
- To evaluate and prioritize different IT projects
- To improve communication between executives and IT
- To learn valuable experience
- …

IV. Measures of IT Business Value

Business value of IT : Overall value of IT on the bottom line performance of an organization

IT investments contribute to overall org. performance by improving

- **financial performance**
- **business performance, and/or**
- **strategic performance**

IV. Measures of IT Business Value

The first step to determine business value of IT is to identify the objectives of IT investments

The next step is to select at least one measure to assess each objective.

There are many measures to choose from and more than one is better.

V. Financial Performance Measures of IT

Ratios	Calculation	Explanation
Profitability measures		
Return on equity	$= \frac{(\text{Net Profit} - \text{Prefered Stock Dividend})}{\text{Common Stock Shareholders Equity}}$	**Measures profitability of the investment to the owners**
Return on assets	$= \frac{(\text{Net Profit} - \text{Prefered Stock Dividend})}{\text{Total Asset}}$	**Measures profitability and how efficiently assets were utilized**
Return on investment	$= \frac{(\text{Net Profit} - \text{Prefered Stock Dividend})}{\text{Invested Capital}}$	**Measure profitability based on total investment, both debt and equity**

V. Financial Performance Measures of IT

Ratios	Calculation	Explanation
Profitability measures		
Return on sales	$= \frac{(\text{Net Profit} - \text{Prefered Stock Dividend})}{\text{Net Sales}}$	**Measures profitability based on sales**
Earnings per share	$= \frac{(\text{Net Profit} - \text{Prefered Stock Dividend})}{\text{Circulated Stocks}}$	**Measures earnings per share value**
Revenue growth	$= \frac{(\text{Revenue}_{current} - \text{Revenue}_{prior})}{\text{Revenue}_{prior}}$	**Measures growth in revenue over the prior period**

V. Financial Performance Measures of IT

Ratios	Calculation	Explanation
Efficiency measures		
Sales by total assets	$= \frac{(\text{Net Sales})}{\text{Total Asset}}$	**Measures how efficiently assets were used to generate sales**
Sales by employee	$= \frac{(Net\ Sales)}{\#\ of\ Employees}$	**Measures sales ability effectiveness**
Inventory turnover	$= \frac{(Sales\ Cost)}{Average\ Inventory}$	**Measures the liquidity of inventory and how fast it is sold**

V. Biz performance measures

- Balanced Score Card (BSC, Kaplan&Norton)

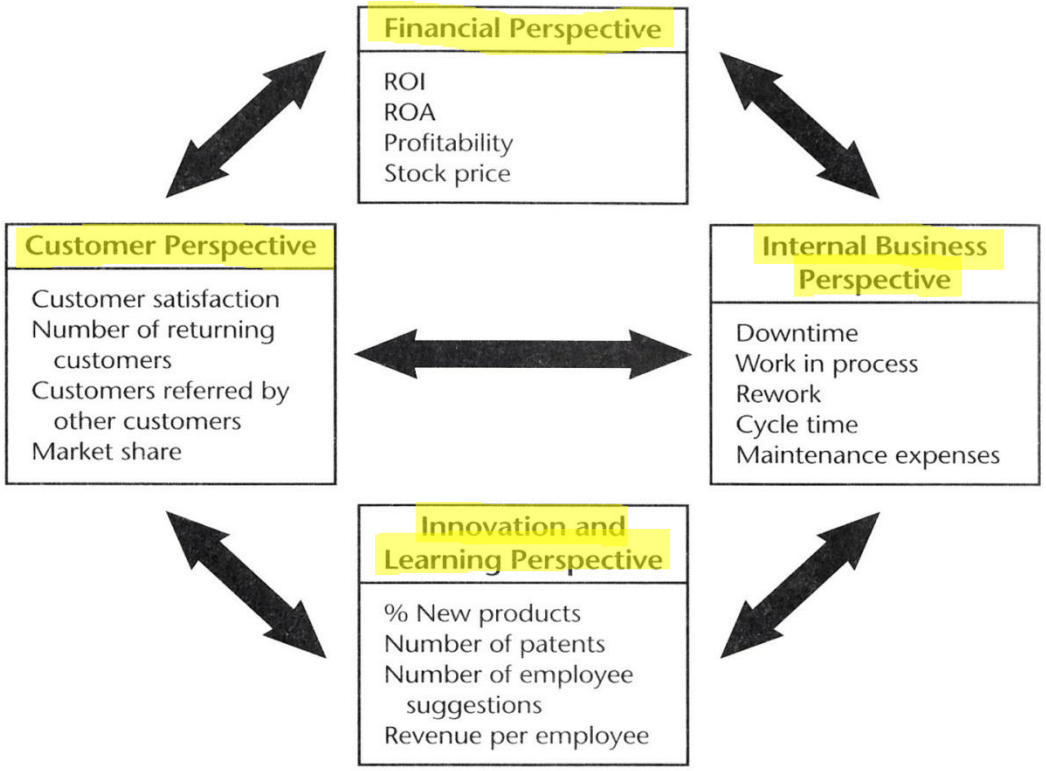


FIGURE 6.1 An example of a balanced scorecard.

V. Biz performance measures

- Balanced Score Card (BSC)
  - Financial (ROI, EPS,..)
  - Operational (CS, Internal process, Innovation & Learning activities)

    ⇨ Future Financial performance
  - BSC
    - Helps mgr. view performance simultaneously
    - Makes mgr. focus on critical measures
    - Force mgr. to consider all the important operational measures
    - Allows mgr. to view their biz from four perspectives
    - (Financial, Customer, Internal, Innovation & Learning)

V. Biz performance measures

1. Financial Perspective
   - A key factor for a company's worth
   - Ability to translate operational performance to improved financial performance
   - Better operating margin
   - Should learn to make explicit linkages between operations and finance

V. Biz performance measures

2. Customer Perspective
   - Critical to a biz survival
   - Time, Quality, Performance & Service, Cost
   - Greater consequences in new technology implementation
   - Perceived ease-of-use & Perceived usefulness

     ➡ Key to User Acceptance

V. Biz performance measures

3. Internal Biz Perspective
   - To stay on top of the competition or To satisfy customer needs
   - Gives mgr. an opportunity to focus on the internal operations enabling the above
   - While host of metrics are tracked, very little is used to assess past and present directions, strategies, and goals for the future

V. Biz performance measures

4. Innovation & Learning Perspective
   - To prepare for the changing landscape of Biz
   - Continuous improvement & Introducing new products and services at the same time
   - Innovation : ability to develop & introduce new product rapidly
   - Learning : ability to continuously improve the existing processes

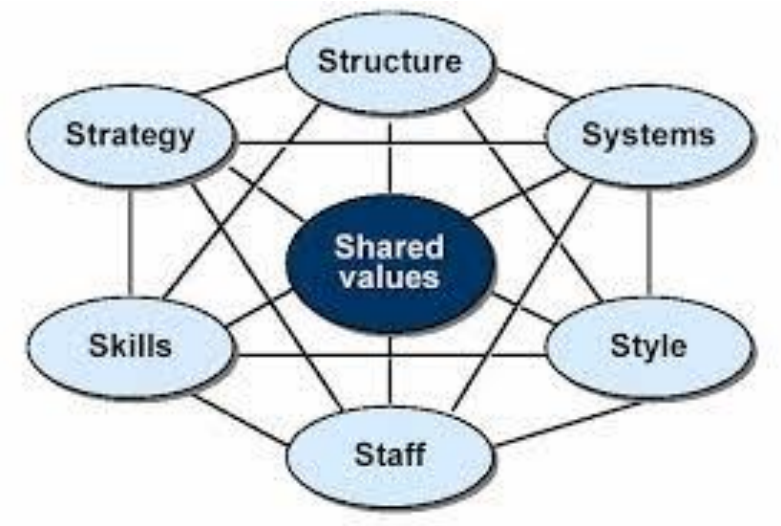
V. Biz performance measures

- Final thoughts on BSC
  - Providing a dashboard of metrics, BSC helps mgr. understand interrelationships between the four perspectives
  - Broader outlook helps mgr. view the org. as a whole and what works best for it

- See Table 2~5

V. Strategic performance measures

- CSF(Critical Success Factors)
  - A few key areas that the org. must excel at to survive and thrive



Seoultech Examples of CSF

1. 전략체계 및 교육목표 구축

대학 KPI 연계표

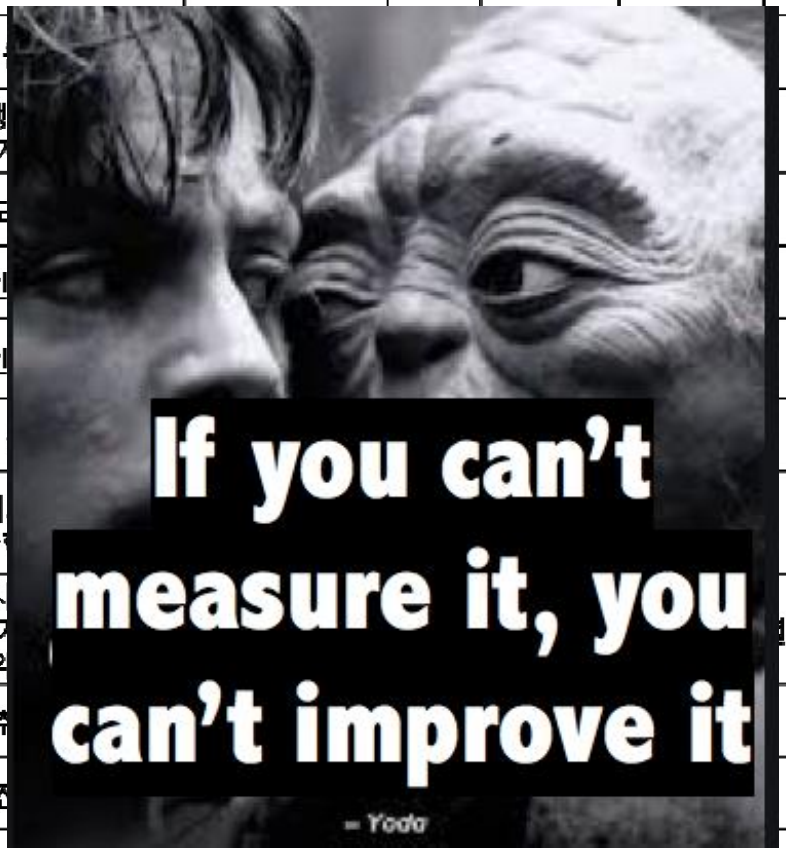
비전, 목표, 전략방향, 핵심성공요소와 대학 KPI 연계표

비전	목표	전략방향	핵심성공요소	핵심성과지표
과학과 인간의 꿈을 실현하는 세계 속의 대학	2020년 국내 10위권 대학 아시아 50위권 대학	글로벌 융복합 인재 양성	맞춤형 교육 강화	교원 확보율
				전임교원 강좌비율
				학생 DREAM 마일리지 평균 점수
				중도 포기율
			국제화 역량 강화	외국인 교수 비율
				외국인 학생 비율
				영어 강좌 비율
				해외파견교환학생 비율
			우수 학생 유치	입학생 평균 수능 백분위
			최우수 인재 배출	취업률
				진학률
		세계 수준의 응용연구역량 확보	연구 성과 극대화	교수당 SCI급 논문수
				해외논문의 교수당 피인용 수
				인문사회 교수당 국내 논문수
			밀착형 산학협력 강화	교수당 교외 연구비
				교수당 교내 연구비
				특허 등록수
				기술이전 수입액
			최우수 교수 유치	신임교수 SCI급 논문수
		수요자 중심의 대학 인프라 구축	행정 선진화	행정서비스 만족도
			안정적 재정 확보	발전기금 모금액
				세입중 납입금 비중
				교육비 환원율
				장학금 지급율
			사회적 평판도 향상	평판도 지수

Critical Success Factors → Key Performance Indicators

Seoultech Examples of CSF

전략 방향	핵심 성공요소	핵심 성과지표	담당 부서	단위	연도별 목표				
					2010년	2011년	2014년	2017년	2020년
글로벌 융복합 인재 양성	맞춤형 교육 강화	전임교원 확보율	교무처	%	61.6	61.8	73.9	79.1	84.4
		전임교					57.0	58.5	60.0
		학생 마일리					28	64	100
		중도					2.46	2.26	2.06
	국제화 역량 강화	외국인					7.6	8.4	9.1
		외국인					3.8	5.0	6.5
		영어					6.27	9.27	15
		해 교환					2.0	3.5	5.0
	우수 학생 유치	정시 수능최저 백분위					도 관 리		
	최으수 인재 배출	취					73.5	76.5	80
		진					11	15.8	20



VI. Costs of IT

Cost Categorizations for IT

Costs by Activity	Costs by Resource
1. Development costs	1. Technology costs
2. Maintenance costs	2. Personnel costs
3. Operating costs	3. Outside services costs
4. User support costs	4. Other costs
5. Administration and other costs	

〈표 Ⅳ-9〉 정보화사업 비용 관련 기준

비용항목		관련 기준
대분류	소분류	
구축 사업비	HW/SW 구매비용	정보시스템 하드웨어 규모산정 지침 (한국정보통신기술협회)
	소프트웨어 개발비	SW사업 대가산정 가이드 (한국소프트웨어산업협회)
	데이터베이스 구축비	DB구축비 대가기준 가이드 (한국정보화진흥원)
	IT 컨설팅 비용	SW사업 대가산정 가이드 (한국소프트웨어산업협회)
	시스템 운용환경 구축비	엔지니어링 사업대가의 기준 (지식경제부)
	정보시스템 감리비	정보시스템 감리기준 (행정안전부)
운영 및 유지·보수비	하드웨어 유지·보수 및 재투자비용	내용연수 (조달청 고시)
	소프트웨어 유지·보수 및 재개발비용	SW사업 대가산정 가이드 (한국소프트웨어산업협회)
	시스템 운영비용	SW사업 대가산정 가이드 (한국소프트웨어산업협회)
	통신회선료	국가정보통신서비스 이용지침서 (행정안전부)

A Guidebook for PFA (KDI, 2013)

VII. Measures of IT Effectiveness Value

- **Effectiveness** = "Doing the right things (Innovation)"
  Efficiency = "Doing the things right (Standardization)"
- Deliver the right products and services, with the right features, to the right customers, at the right time

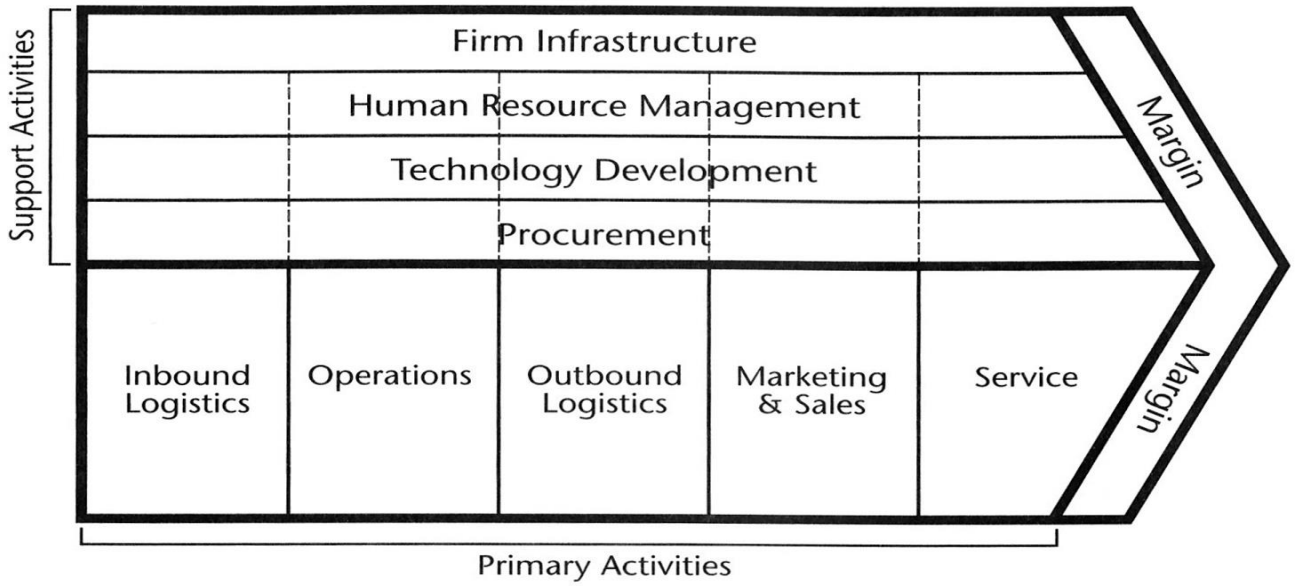


FIGURE 3.2 The generic value chain.

VII. Measures of IT Effectiveness Value

- How to access Effectiveness factors
  1) To identify the biz. process supported by IT(Porter's VCM)
  2) To identify the different categories of IT(Table 7)
  3) To create a process/IT matrix of biz. Process(Fig. 3)
  4) To access an effectiveness factor(Table 8)

- Effectiveness Factors(Table 9) → criteria → measures
  1) Identify IT factors
  2) Define effectiveness criteria for all the factors
  3) Develop measures for the criteria

- Measuring the IT Effectiveness examples
  1) To support biz. Processes (Table 8)
  2) To support employees (Table 10)
  3) To meet biz. requirements (Table 11, 12)

VIII. Measures of IT Efficiency Value

- Efficiency = "Doing the things right"
- Produce the desired effect with minimum IT expenses
- Effectiveness first, then efficiency follows.
- See Table 13

IT Efficiency and Effectiveness Measures

1. Efficiency Metrics

	Efficiency IT Metrics
Throughput	The amount of information that can travel through a system at any point.
Transaction speed	The amount of time a system takes to perform a transaction.
System availability	The number of hours a system is available for users.
Information accuracy	The extent to which a system generates the correct results when executing the same transaction numerous times.
Web traffic	Includes a host of benchmarks such as the number of page views, the number of unique visitors, and the average time spent viewing a web page.
Response time	The time it takes to respond to user interactions such as a mouse click.

Efficiency focuses on the extent to which an organization is using its resources in an optimal way

Effectiveness focuses on how well an organization is achieving its goals and objectives

2. Effectiveness Metrics

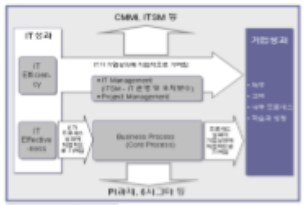
	Effectiveness IT Metrics
Usability	The ease with which people perform transactions and/or find information. A popular usability metric on the Internet is degrees of freedom, which measures the number of clicks required to find desired information.
Customer satisfaction	Measured by such benchmarks as satisfaction surveys, percentage of existing customers retained, and increases in revenue dollars per customer.
Conversion rates	The number of customers an organization "touches" for the first time and persuades to purchase its products or services. This is a popular metric for evaluating the effectiveness of banner, pop-up, and pop-under ads on the Internet.
Financial	Such as return on investment (the earning power of an organization's assets), cost-benefit analysis (the comparison of projected revenues and costs including development, maintenance, fixed, and variable), and break-even analysis (the point at which constant revenues equal ongoing costs).

Bank of Korea IT Performance Metrics

3. IT투자성과평가 기준

IT투자성과평가 지표 Framework

McKinsey Model



- IT Effectiveness
- IT Efficiency

BSC Model

- 재무
- 고객
- 내부프로세스
- 학습과 성장

성과지표 Type

- 정성적 효과
- 비 재무적 정량 효과
- 재무적 정량 효과

IT성과지표 관리 Framework