Ultimate Economic Measures of Performance

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Outline

- Why economics
- Technical & operational bases for decisions
- Business & economics
- Ship elements & acquisition costs
- Operations, operation & support costs, revenues
- Comparing alternative ships, systems, capabilities
- Deciding based on economic/business factors

Economics provides the right framework for making significant decisions, and it's entirely feasible.

The role of economics

Economics provides a framework for making significant decisions.

- Many feasible decision alternatives available – Which would be best?
- What we should do vs. what we can do
- Can is about technical & operational characteristics
- Should is about our objectives and values

A definition

"Economics is the study of the use of scarce resources which have alternative uses."

Lionel Robbins

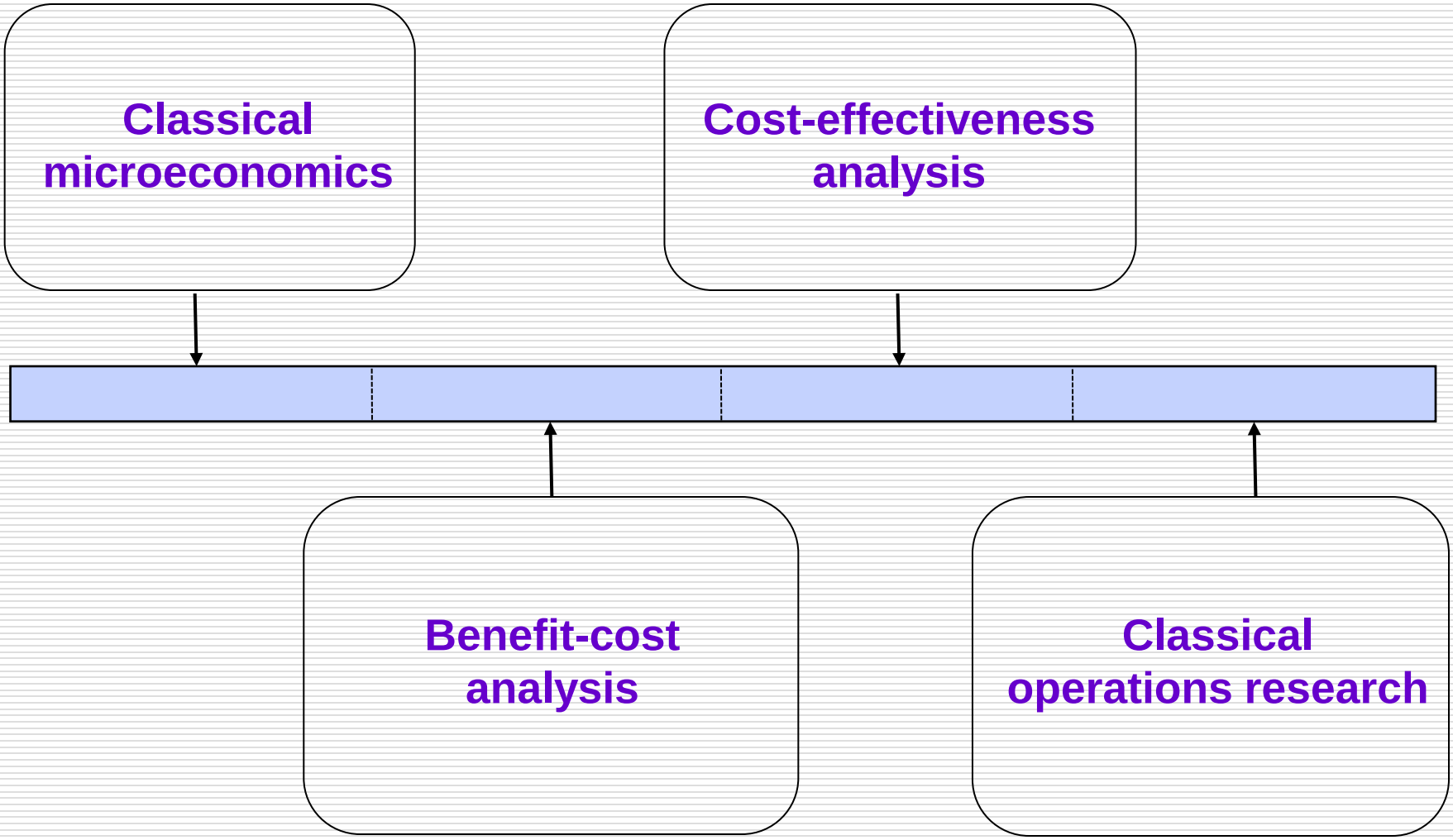
Moreover it's about how people make choices when they can't afford everything they want.

A definition closer to ship design

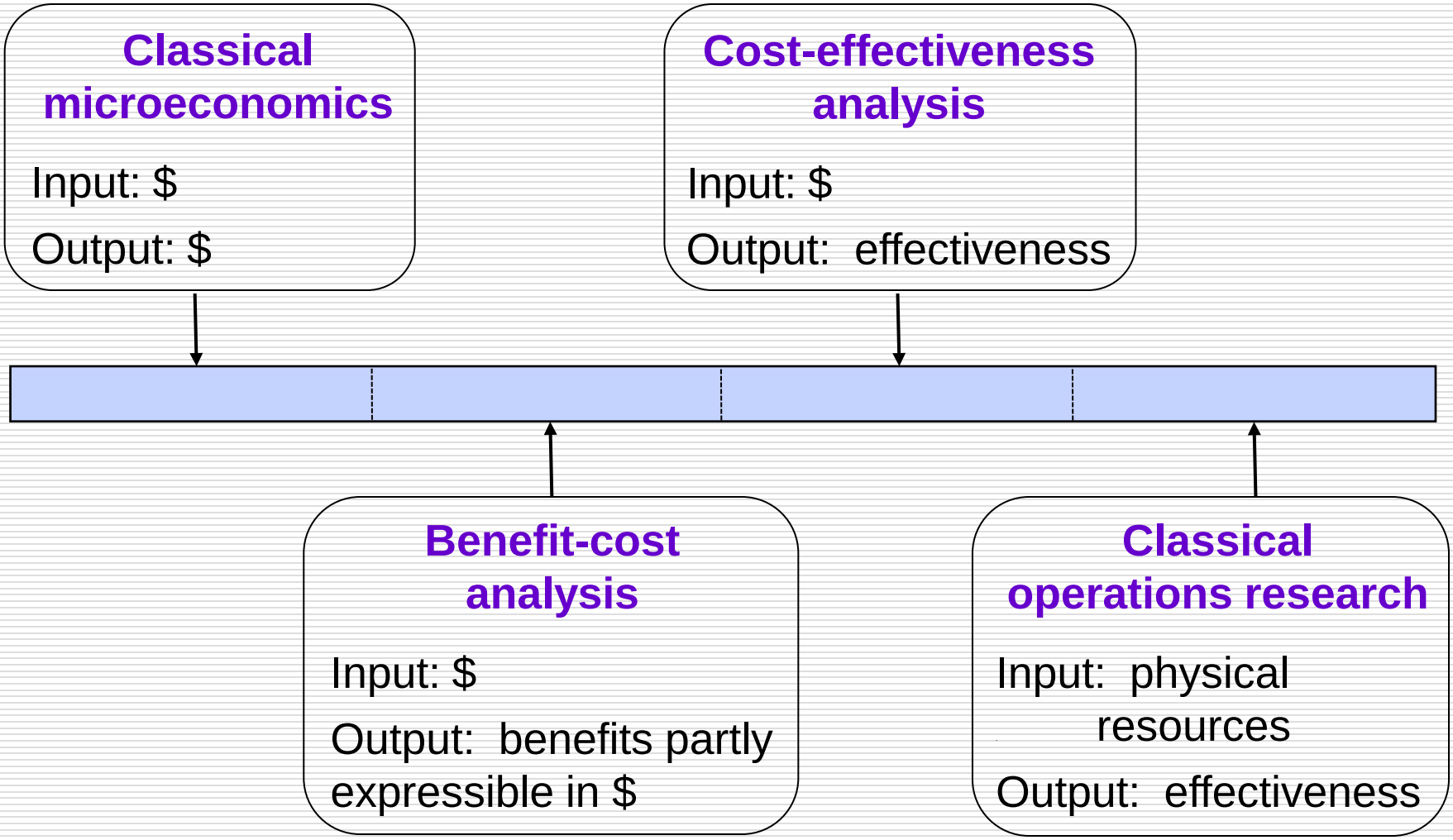
"Engineering economics is the art and science of making design decisions that meet society's needs while making best possible use of scarce resources."

Harry Benford

The spectrum of economic analysis



The spectrum of economic analysis



Deciding on technical & operational bases

- Technical characteristics (& intended capabilities)
  - Power & speed
  - Capacities: seats, tons, lane-meters
  - Ton-miles per day
  - Ton-knots per horsepower
  - Ounces CO_2 per ton-mile
- Operational capabilities in service
  - Voyage time
  - Load/unload time
  - Round trips per month/year
  - Actual capacities & ton-miles/day
  - Maneuvering/docking ease
  - Reliability
  - Environmental performance

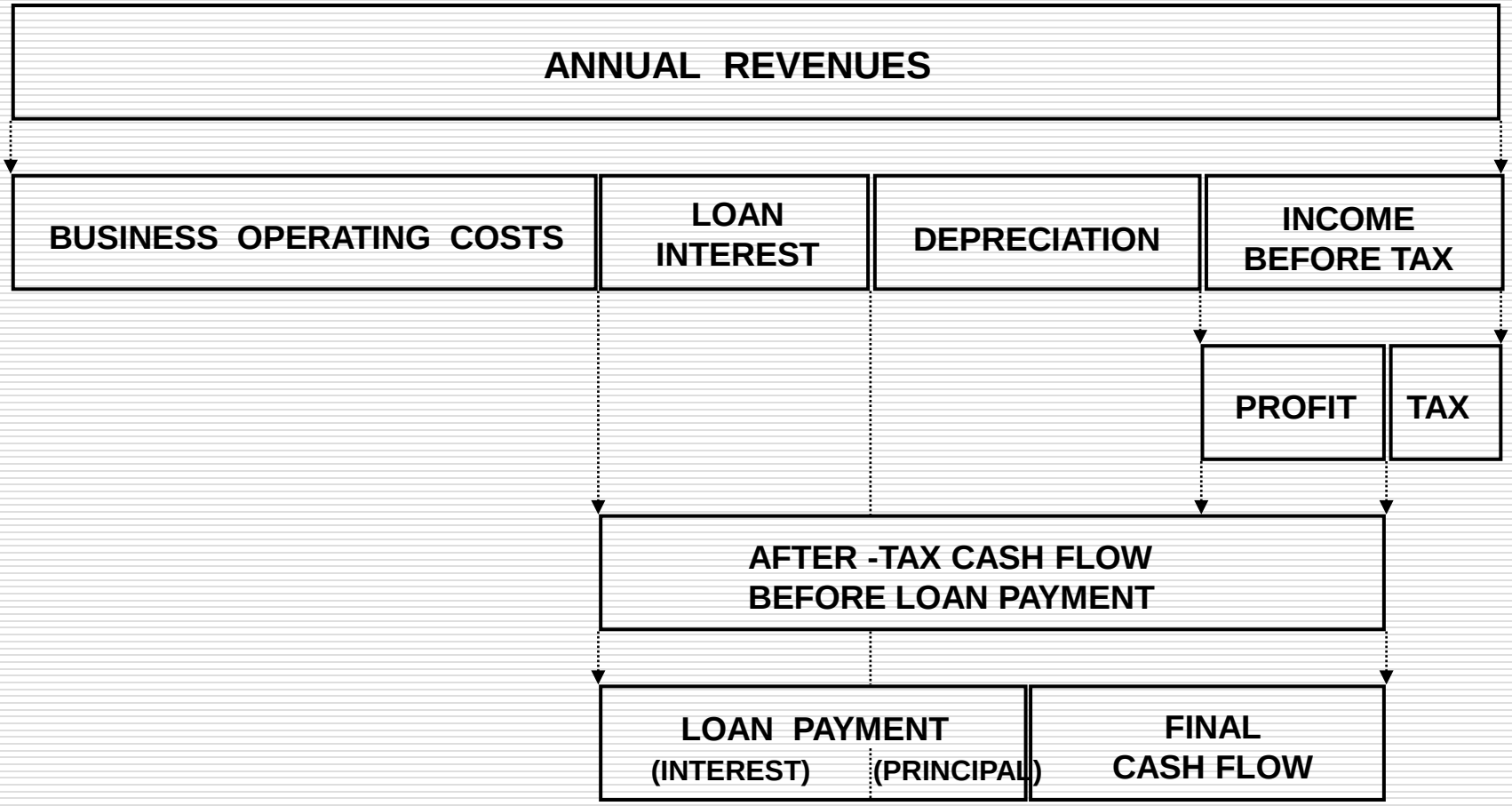
The technical aspects become embedded in the operational aspects.

Deciding based on business & economics

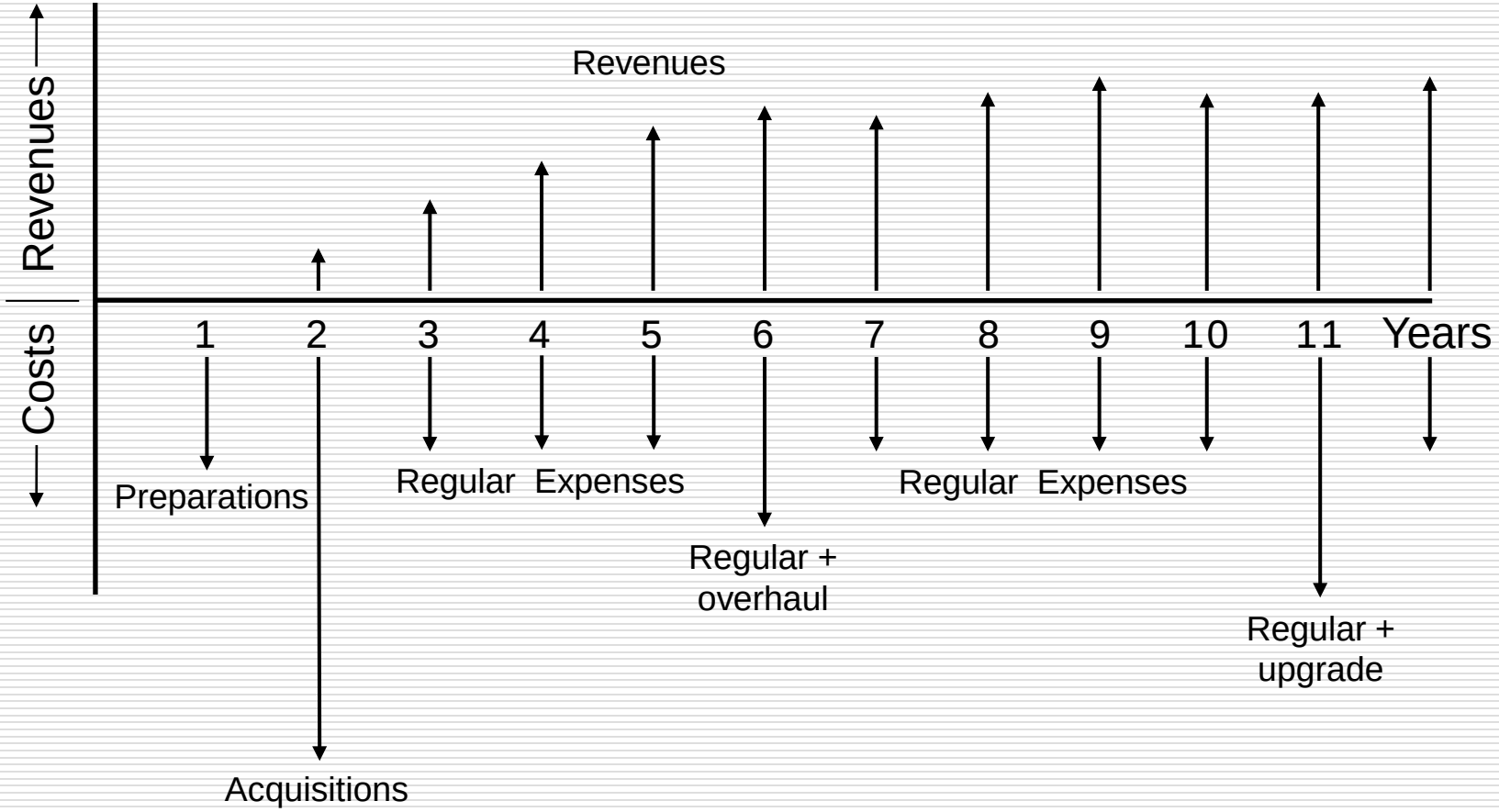
- Business (financial results)
  - Revenues & costs
  - Profit or loss
  - Balance sheet
  - Products & services
  - People & jobs
- Economic (business + broader effects)
  - Wider business activity
  - Connected companies & jobs
  - 401Ks & IRAs
  - Contributions to GDP

The operational aspects get translated into business results.

Determining annual profitability



Cash flows over time



Assessing profitability over time

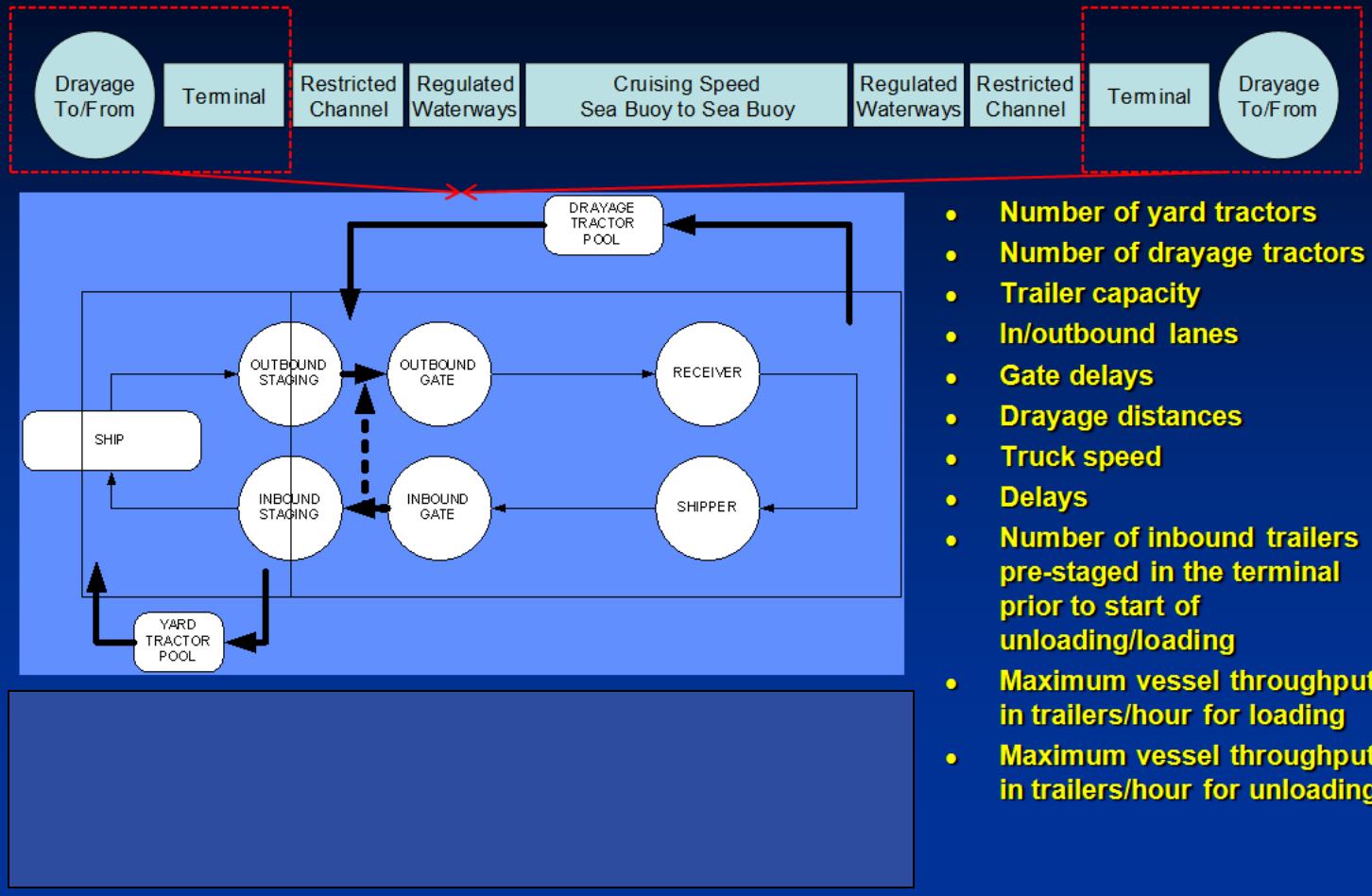
RO-RO SERVICE	Years							
	1	2	3	4	5	6	…	N
Revenues								
Vehicles								
Passengers								
Freight								
Total revenues								
Capital costs								
Outlays, loan/lease payments								
Depreciation/amortization								
Operating costs								
Ships (crews, fuel, ports, etc.)								
Facilities & other								
Total costs								
Net income before taxes								
Taxes								
Net income after taxes								
Cash flow before loan payments (net income + depreciation)								
Loan payments								
Final cash flow								
Net Present Value at ___% discount :								

Categories of costs over the life cycle

- Development & start-up
  - Planning
  - Studies
  - Authorizations, licenses, leases
  - Ship selection
  - Finding & obtaining funds
- Acquisition
  - Ships
  - Terminals, support facilities, equipment
  - Connecting infrastructure
  - Land vehicles
  - Office space
  - Personnel
  - Marketing & advertising
- Operating & support
  - General & administrative staff
  - Crews and support personnel
  - Training and crew certification
  - Terminal and facilities operations
  - Security
  - Fuel & lubricants
  - Ship servicing, maintenance, repair
  - Facility maintenance
  - Ship inspections
  - Marketing & advertising
  - Insurance
  - Working capital & contingency fund
  - Loan & lease payments
  - Depreciation & amortization
  - Port & terminal charges
  - Permits, licenses, fees
  - Property & income taxes

Simulation of operations

Short Sea Shipping Simulation Model



- Number of yard tractors
- Number of drayage tractors
- Trailer capacity
- In/outbound lanes
- Gate delays
- Drayage distances
- Truck speed
- Delays
- Number of inbound trailers pre-staged in the terminal prior to start of unloading/loading
- Maximum vessel throughput in trailers/hour for loading
- Maximum vessel throughput in trailers/hour for unloading

from Matt Tedesco simulation for CCDoTT

Conclusions

- Economic measures should be our ultimate measures for major decisions
- Technical & operational measures are essential – but only tell us what is possible, what we can do
- Business & economic measures provide a basis for deciding what we should do
- We know how to estimate the costs & revenues
- We can connect them to the income statement and balance sheet
- Every decision can be tied to its probable effects on profit or loss

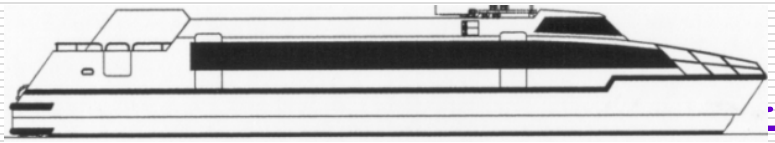
Back-ups

Ferry capabilities & features

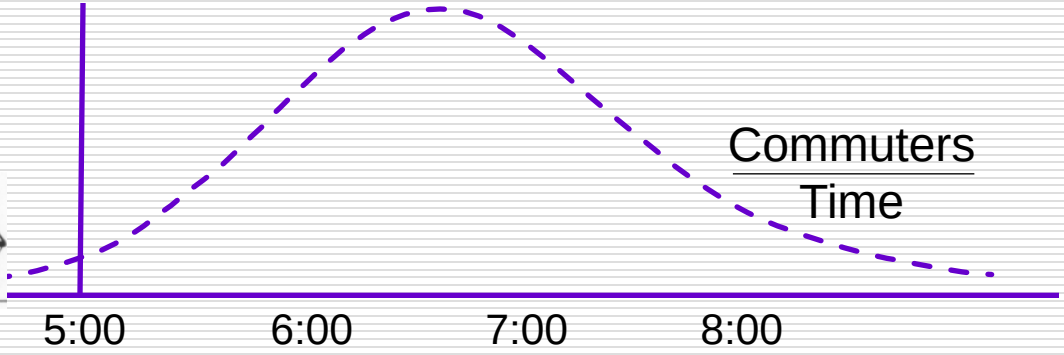
- Passenger capacity
- Service speed
- Turn-around time
- Dependability
- Quality & comfort
- Onboard amenities
- Wake-wash, pollution, noise

Ferry system tradeoffs

- Some major trade-offs
  - 149-passenger boats
    - 9 at 23 kts
    - 8 at 26 kts
    - 7 at 29 kts
    - 6 at 33 kts
  - 250-passenger boats
    - 6 at 21 kts
    - 5 at 24 kts
    - 4 at 30 kts
  - 350-passenger boats
    - 4 at 21 kts
    - 3 at 28 kts



- A larger number of smaller/faster boats will
  - Attract more riders
  - Improve reliability & flexibility
  - Reduce terminal size and approach road congestion
  - Cost more



Compare alternatives by cash flow & NPV

Ferry Concept Alternatives	NPV	Free cash flow							
		'13	'14	'15	'16	'17	'18	…	N
149-passenger boats									
9 @ 23 kts									
8 @ 26 kts									
7 @ 29 kts									
6 @ 33 kts									
250-passenger boats									
5 @ 24 kts									
4 @ 30 kts									
350-passenger boats									
4 @ 21 kts									
3 @ 28 kts									

Effects of adding an item of equipment

- The item itself
- Support from the ship
  - Space, accessibility
  - Structural support, mounting/isolation
  - Electric power, cooling, ventilation
  - Control signals, data
  - Protection from EMI, heat, fire
  - Ongoing operation, maintenance, repair
  - Ongoing logistic support
  - Buoyancy to carry added weight
  - Increased ship power & fuel
- Negative effects to be contained
  - Heat, noise, vibration, EMI
  - Waste, effluent, pollution, odors

These generate a compounding effect that increases the final amounts.

Each also has costs that must be paid.

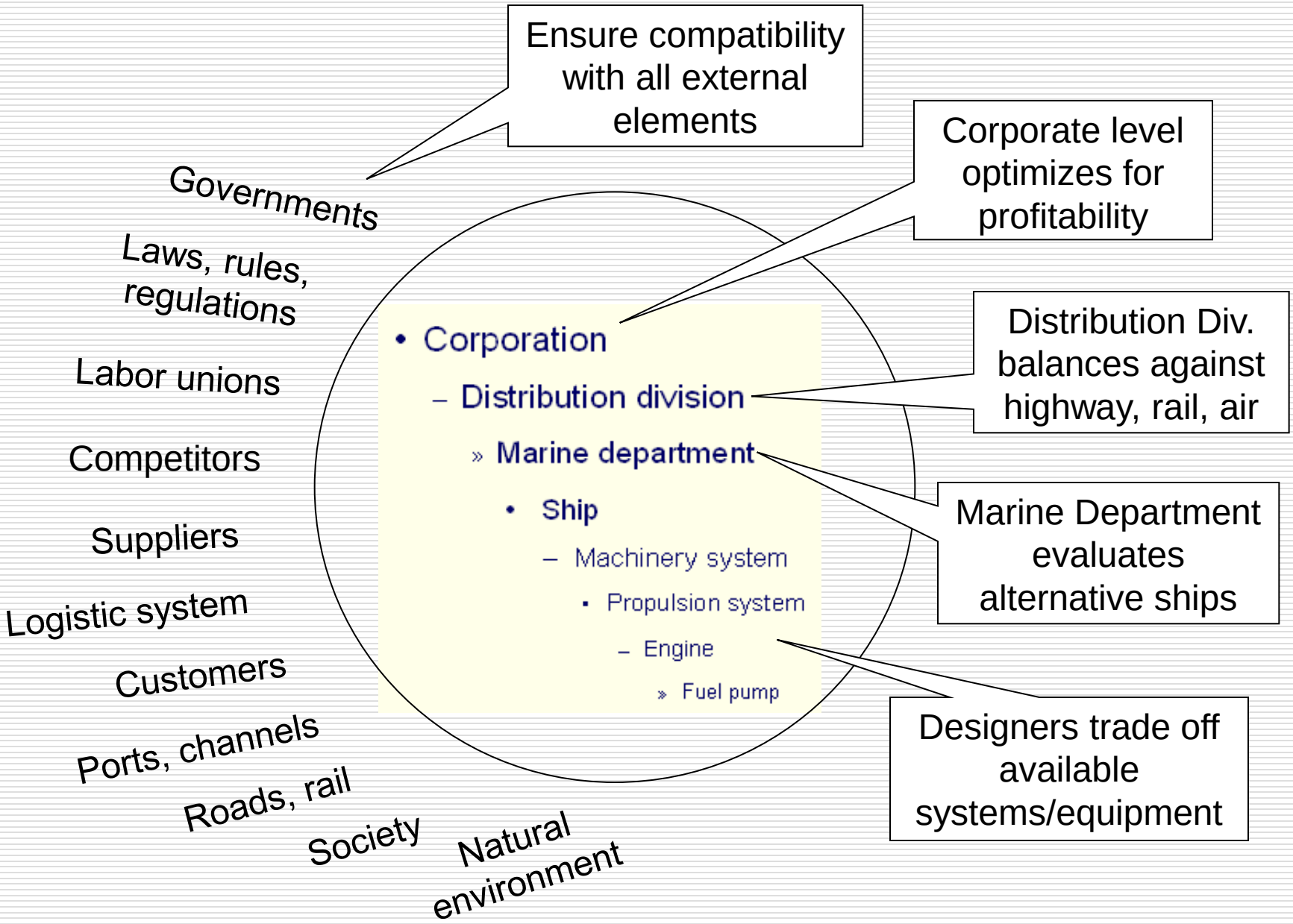
Owners can't afford to install equipment that won't pay its way.

A general concept of “cost”

Cost: any negative consequence we accept ourselves or cause others to experience in order to achieve a result.

- Monetary costs
- Uncompensated time
- People placed at risk
- Injuries or deaths
- Environmental impacts
- Societal disruption
- Unpleasantness endured
- “Borrowed” systems

Corporation and its environment



Other factors & risks

- Competitive conditions
- Health of the economy
- Inflation/deflation expectations
- Availability & cost of financing
- Political environment, regulation
- Cost trends of labor, fuel, major items
- Tax & subsidy changes
- Environmental requirements & issues
- Demographic trends

(These might increase costs, necessitate a higher rate of return, or convince a company to do something else.)

Ship component breakdown

Group 1 Hull Structure

110 Shell And Supporting Structure
120 Hull Structural Bulkheads
130 Hull Decks
140 Hull Platforms And Flats
150 Deck House Structure
160 Special Structures
170 Masts, Kingposts, And Service Platforms
180 Foundations
190 Special Purpose Systems

Group 2 Propulsion Plant

210 Energy Generating Systems (Nuclear)
220 Energy Generating Systems (Nonnuclear)
230 Propulsion Units
240 Transmission And Propulsor Systems
250 Propulsion Support Systems (Except Fuel/Lube)
260 Propulsion Support Systems (Fuel And Lube Oil)
290 Special Purpose Systems

Group 3 Electric Plant

310 Electric Power Generation
320 Power Distribution Systems
330 Lighting System
340 Power Generation Support Systems
390 Special Purpose Systems

Group 4 Command & Surveillance

410 Command And Control Systems
420 Navigation Systems
430 Interior Communications
440 Exterior Communications
450 Surveillance Systems, Surface And Air
460 Surveillance Systems (Underwater)
470 Countermeasure Systems
480 Fire Control Systems
490 Special Purpose Systems

Group 5 Auxiliary Systems

510 Climate Control
520 Sea Water Systems
530 Fresh Water Systems
540 Fuels And Lubricants, Handling And Storage
550 Air, Gas, And Miscellaneous Fluid Systems
560 Ship Control Systems
570 Replenishment Systems
580 Mechanical Handling Systems
590 Special Purpose Systems

Group 6 Outfit & Furnishings

610 Ship Fittings
620 Hull Compartmentation
630 Preservatives And Coverings
640 Living Spaces
650 Service Spaces
660 Working Spaces
670 Stowage Spaces
690 Special Purpose Systems

Group 7 Armament

710 Guns And Ammunition
720 Missiles And Rockets
730 Mines
740 Depth Charges
750 Torpedoes
760 Small Arms And Pyrotechnics
770 Cargo Munitions
780 Aircraft Related Weapons
790 Special Purpose Systems

Group F Full Load, Loads

F10 Ships Force, Amphib. Force, Troops And Passengers
F20 Mission Related Expendables And Systems
F30 Stores
F40 Fuels And Lubricants
F50 Liquids And Gases (Non Fuel Type)
F60 Cargo
F70 Sea Water Ballast (Submarines)

Construction cost estimating

			Material		Labor					
Shipbuilder Costs for Ship Material & Equipment	Type Indicator	Group Weight, Ltons	Unit Material Cost, $/Lton	Group Material Cost $	Labor, hrs/Lton	Unit Labor Cost $/hr	Group Labor Cost $	Other Cost $	Total Cost $	GFM? Y/N
Group 1 Hull Structure										
Alternative Structural Materials:										
Steel										
Aluminum										
Composite 1										
Composite 2										
Other material										
110 Shell & Supports										
120 Hull Structural Bulkheads										
130 Hull Decks										
140 Hull Platforms & Flats										
150 Deckhouse Structure										
160 Special Structures										
170 Masts, Kingposts, Service Platforms										
180 Foundations										
190 Special Purpose Systems										
Group 1 Total:										

Construction cost estimating

			Material		Labor					
Shipbuilder Costs for Ship Material & Equipment	Type Indicator	Group Weight, Ltons	Unit Material Cost, $/Lton	Group Material Cost $	Labor, hrs/Lton	Unit Labor Cost $/hr	Group Labor Cost $	Other Cost $	Total Cost $	GFM? Y/N
Group 5 Auxiliary Systems -										
510 Climate Control										
520 Seawater Systems										
530 Fresh Water Systems										
540 Fuels & Lubricants Handling & Storage										
550 Air, Gases, Miscellaneous Fluids										
560 Ship Control Systems										
570 Underway Replenishment Systems										
580 Mechanical Handling Systems										
590 Special Purpose Systems										
Group 5 Total:										
Group 6 Outfit & Furnishings -										
610 Ship Fittings										
620 Hull Compartmentation										
630 Preservation & Coatings										
640 Living Spaces										
650 Service Spaces										
660 Working Spaces										
670 Stowage Spaces										
690 Special Purpose Systems										
Group 6 Total:										

Ship components can all be costed