

Project Appraisal, Scoping and Estimation

Week 3

Last Week

- What is Project Management?
- Project Definition
- Stakeholder Management
- Organizing the Project

This Week

Defining the Project

- Project Appraisal Techniques
- Project Scope Management
- Project Estimation

Project Appraisal

- Payback Period
- Discounted Payback
- Net Present Value
- Internal Rate of Return
- Decision Tree Analysis

Payback Period

- Simplest financial measure
- Divide the initial costs by the net cash flow per year
- It is the length of time required to recover the project's initial capital charges and expenses
- The longer the payback period the riskier the project
- Does not account for factors of time value of money

YEAR	NET CASH INFLOW/(OUTFLOW)	CUMULATIVE FLOW	BALANCE
0	(56,000.00)	-	(56,000.00)
1	17,500.00	17,500.00	(38,500.00)
2	26,250.00	43,750.00	(12,250.00)
3	39,688.00	83,438.00	27,438.00
4	27,891.00	111,329.00	55,329.00

- The payback period occurs in year 3
- If cash flows evenly throughout year 3
- Payback period is 2 years 3.7months

Discounted Payback Period

- Uses a discounted cash flow to alleviate the problem of taking into account the time value of money
- Discount Factor

$$\frac{1}{(1 + i)^n}$$

Where 'i' is the interest rate used

What is Present Value

- If \$100.00 is received today and invested for an annual net return of 10%, that \$100.00 should be worth \$110.00 after one year
- Put another way, \$110.00 received in one year's time is equivalent to receiving only \$100.00 TODAY
- Effectively discounting future cash flows back to TODAY'S value

Present Value Table



Year	Present Value of \$1.00 discounted at:				
	8%	10%	12%	14%	15%
0	1	1	1	1	1
1	0.926	0.909	0.893	0.877	0.870
2	0.857	0.826	0.797	0.769	0.756
3	0.794	0.751	0.712	0.675	0.658
4	0.735	0.683	0.636	0.592	0.572
5	0.681	0.621	0.567	0.519	0.497
6	0.630	0.564	0.507	0.456	0.432



YEAR	NET CASH INFLOW/(OUTFLOW)	DISCOUNT FACTOR at 10%	PRESENT VALUES	BALANCE
0	(56,000.00)	1		(56,000.00)
1	17,500.00	0.909	15,907.50	(40,092.50)
2	26,250.00	0.826	21,682.50	(18,410.00)
3	39,688.00	0.751	29,805.69	11,395.69
4	27,891.00	0.683	19,049.55	30,445.24

- Again Payback will occur in the 3rd year
- Assuming that the cash flow occur evenly throughout year 3
- Payback Period will be 2yrs and 4.6months

Net Present Value

- Think of a project as an abandoned suitcase containing money.
- If the amount of cash is positive you will pick it up
- If the suitcase contains 'negative cash' which would diminish your wealth you will leave it alone
- NPV simply states how much money is in the suitcase and whether it is positive or negative

- NPV technique involves estimating the cash flows associated with an investment, discounting those cash flows received or paid in the future and deducting the cost of the initial investment

YEAR	Discount Factor at 12%	Project A Cash Inflow/(Outflow)	Present Value	Project B Cash Inflow/(Outflow)	Present Value
0	1	(110,000.00)	(110,000.00)	(110,000.00)	(110,000.00)
1	0.893	40,000.00	35,720.00	20,000.00	17,860.00
2	0.797	35,000.00	27,895.00	25,000.00	19,925.00
3	0.712	30,000.00	21,360.00	30,000.00	21,360.00
4	0.636	25,000.00	15,900.00	35,000.00	22,260.00
5	0.567	20,000.00	11,340.00	40,000.00	22,680.00
NET PRESENT VALUE			2,215.00		(5,915.00)

Internal Rate of Return

- IRR is the discount rate where the present value of the cash inflows exactly equals the initial investment
- In other words IRR is the discount rate when $NPV = 0$

IRR is found by:

- Discounting the cash flows using 2 different rates sufficiently far apart to give one positive and one negative NPV
- Interpolating the NPV's
- $IRR = X + [(a/(a+b))(Y-X)]$

X-Lower Rate,

Y-Higher Rate

a-NPV @ lower rate,

b-NPV @ higher rate (absolute value)

Example IRR

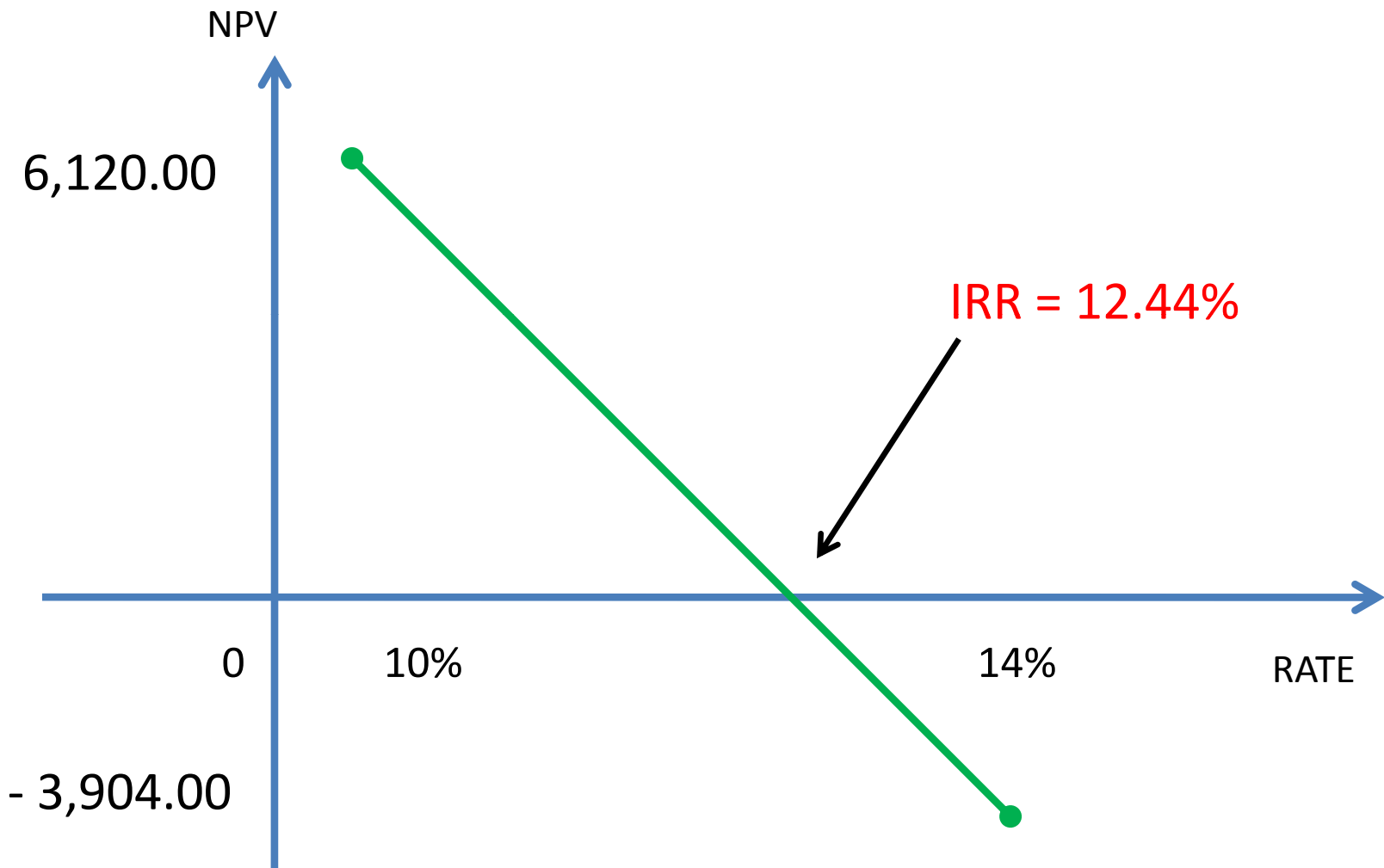
- Capital Investment- 100,000.00
- Annual net cash flows- 28,000.00
- NPV @ 10%- 6,120.00
- NPV @ 14%- (3,904.00)

- IRR $=10\% + [(6120/(6120+3904))(14\%-10\%)]$

$$=10\% + [(0.6105)(4\%)]$$

$$=10\% + [2.442\%]$$

$$=12.44\%$$



Decision Trees

- Method of prioritizing projects which require a series of decisions
- Provide structured view of different project options and investigate possible outcomes of choosing each option
- They take into account estimated risks and rewards associated with each possible course of action
- The following example is taken from www.mindtools.com

Figure 2

Example Decision Tree:
Should we develop a new product or consolidate?

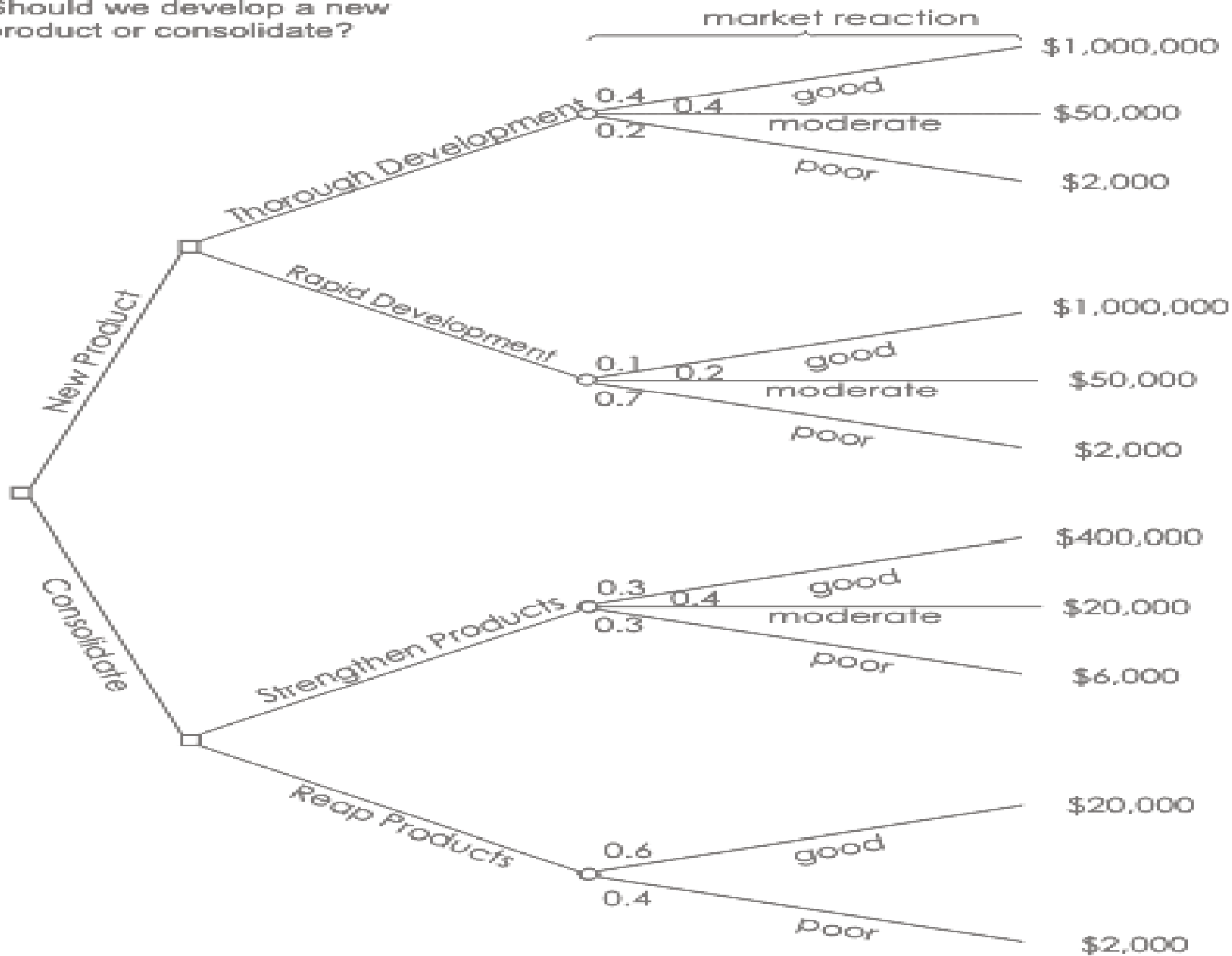


Figure 3

Example Decision Tree:
Should we develop a new product or consolidate?

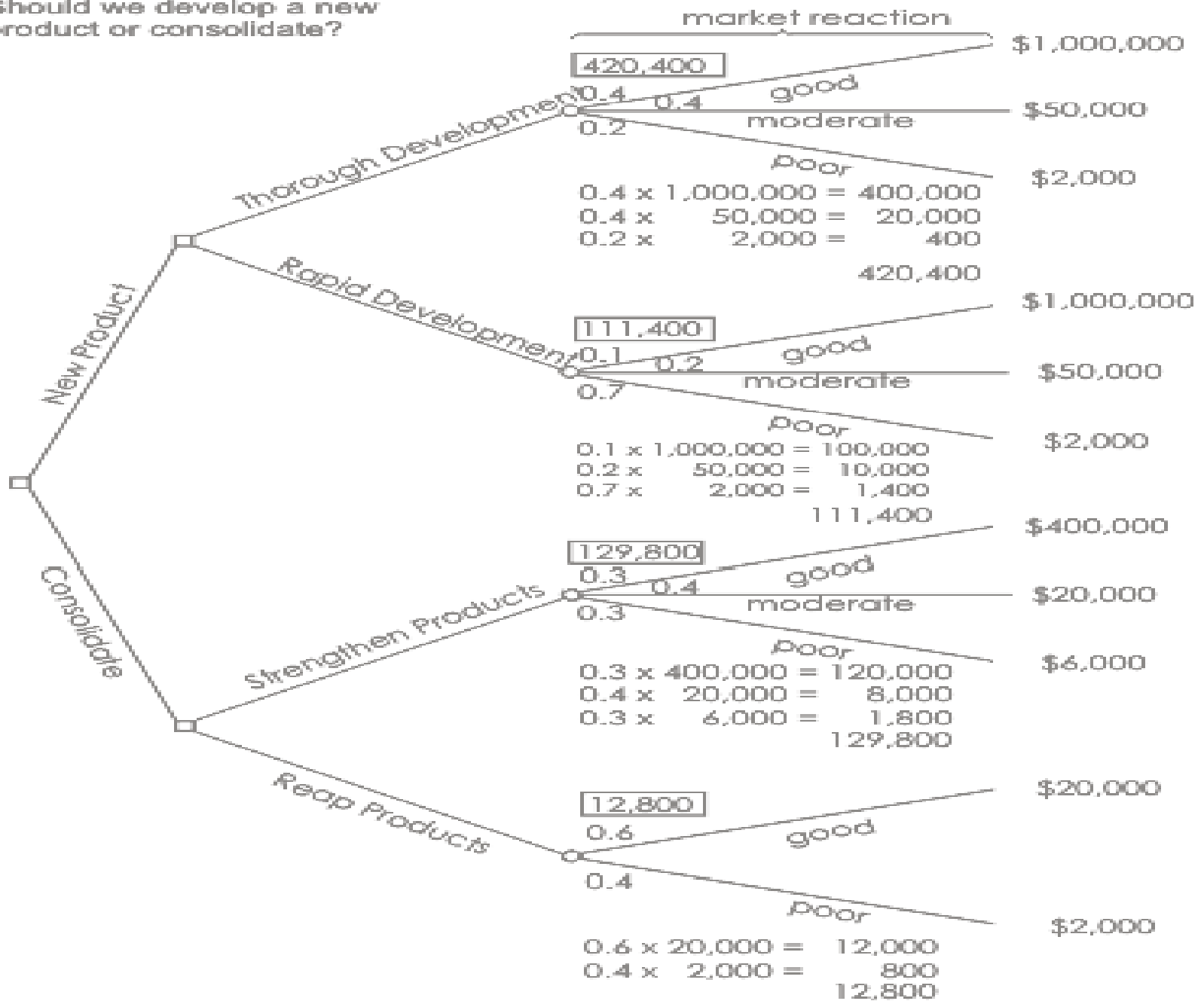
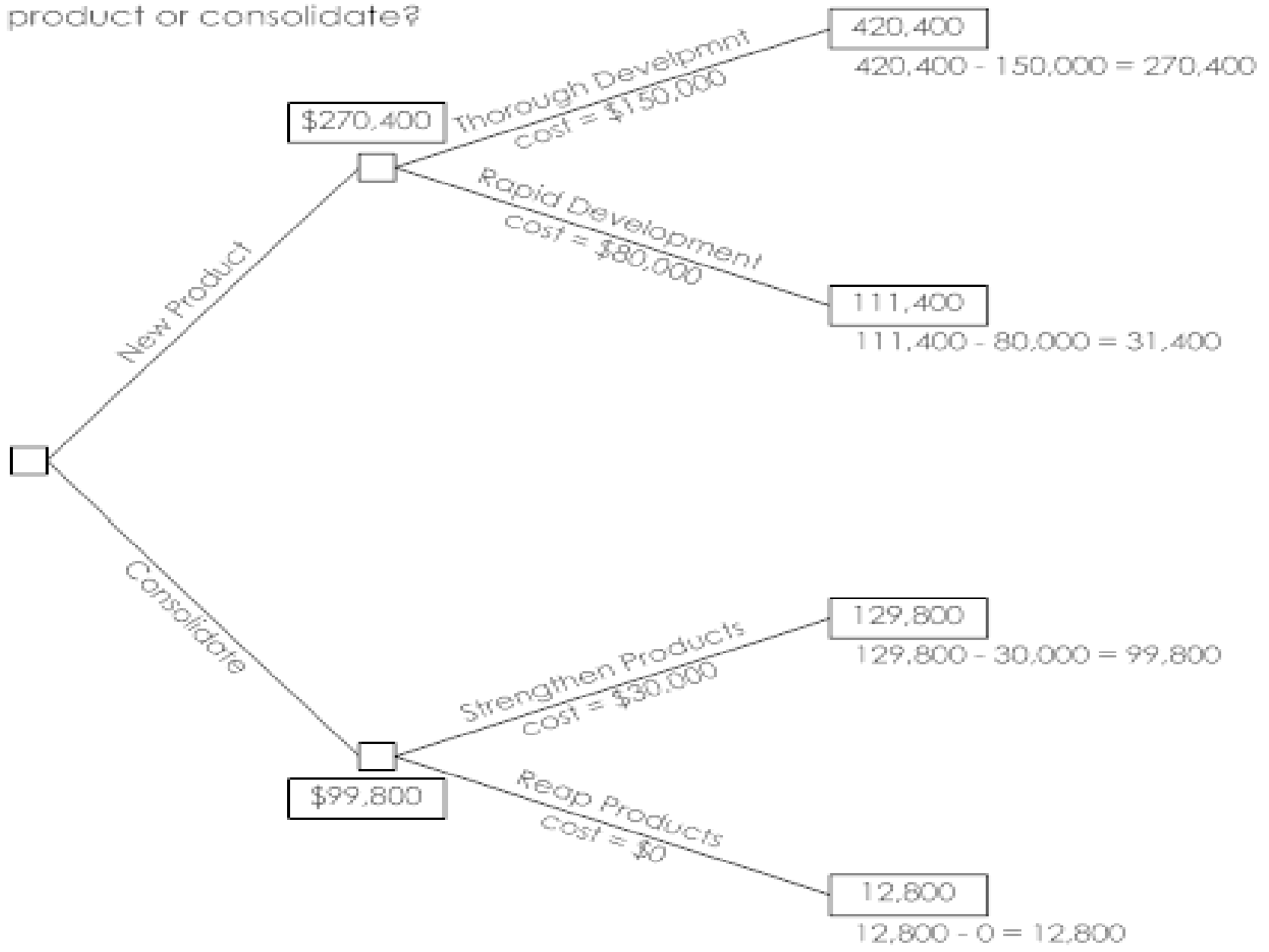


Figure 4:
Example Decision Tree:
Should we develop a new
product or consolidate?



Project Scope Management

- “ensuring that enough, but only enough, work is undertaken to deliver the project’s purpose successfully” Turner (1999, pg. 93)
- In the project context scope may refer to
 - Product scope- the features and functions that characterize a product or service
 - Project scope- the work that must be done to deliver a product with the specified features and functions

Managing Scope Creep

- Scope creep involves subtle changes made to the product without approvals
- This should be under the watchful eye of the project manager
- It should be managed through the process of **Scope Change Control**

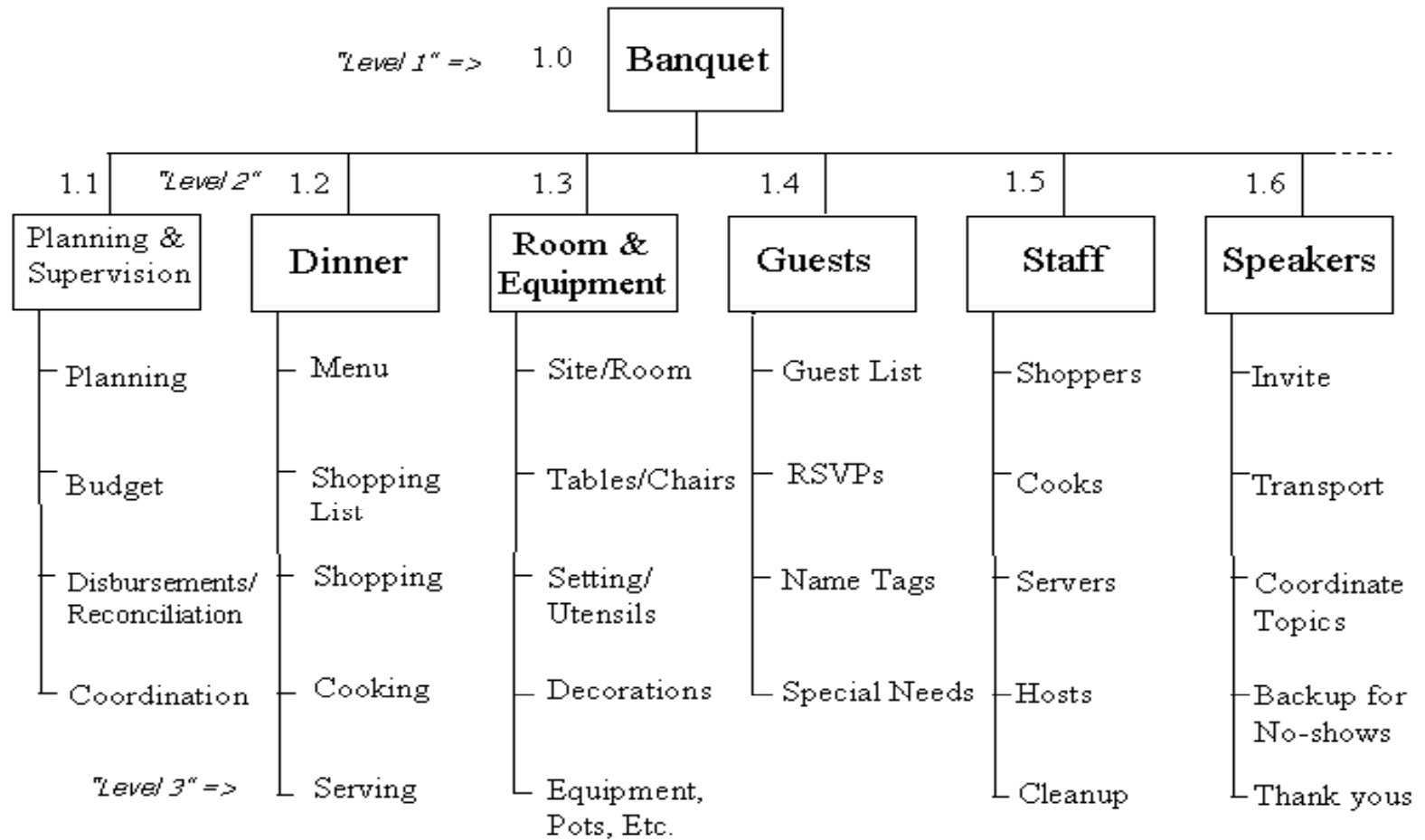
Using Breakdown Structures

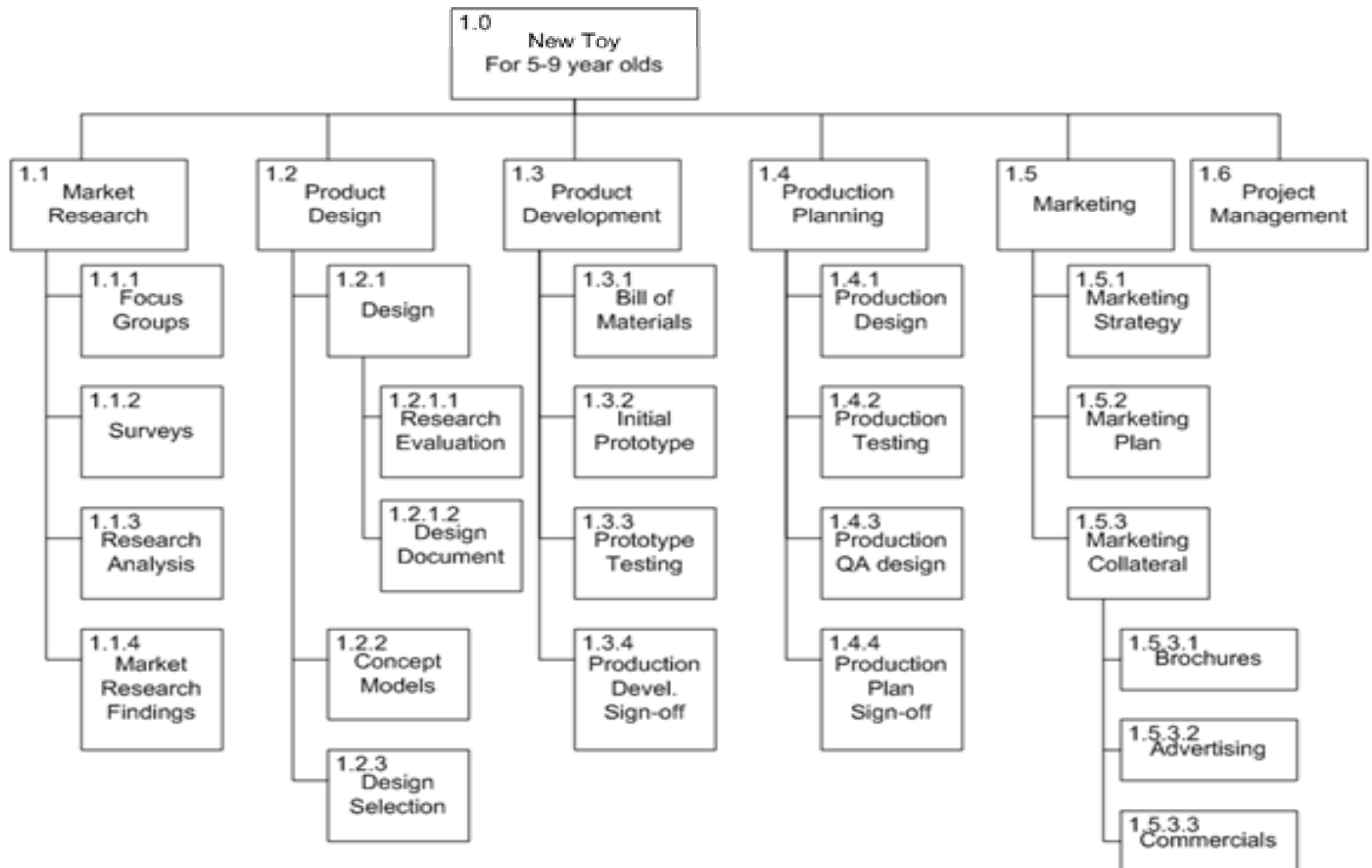
- A technique by which the project is divided and subdivided for mgt and control purposes
 - ADVANTAGES
- Better control of work definition
- Work delegated in coherent package
- Work can be defined at appropriate level for estimating
- Containment of risk
- Product Breakdown Structure (PBS)
- Work Breakdown Structure (WBS)
- Organization Breakdown Structure (OBS)

WBS-'Chunking'

- Hierarchical tree of all the tasks needed to complete a project
- Each level progressively gets more and more detailed until the bottom level is reached which shows all the smallest day to day tasks
- Maps out a view of Project Stages, Phases, Work Packages, Activity ,Tasks or Steps

WBS Example - Banquet





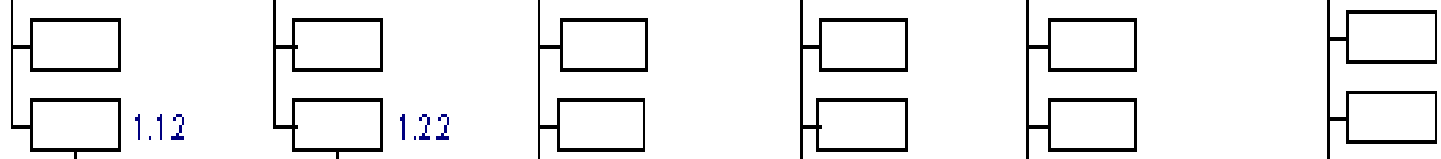
WBS Level 1



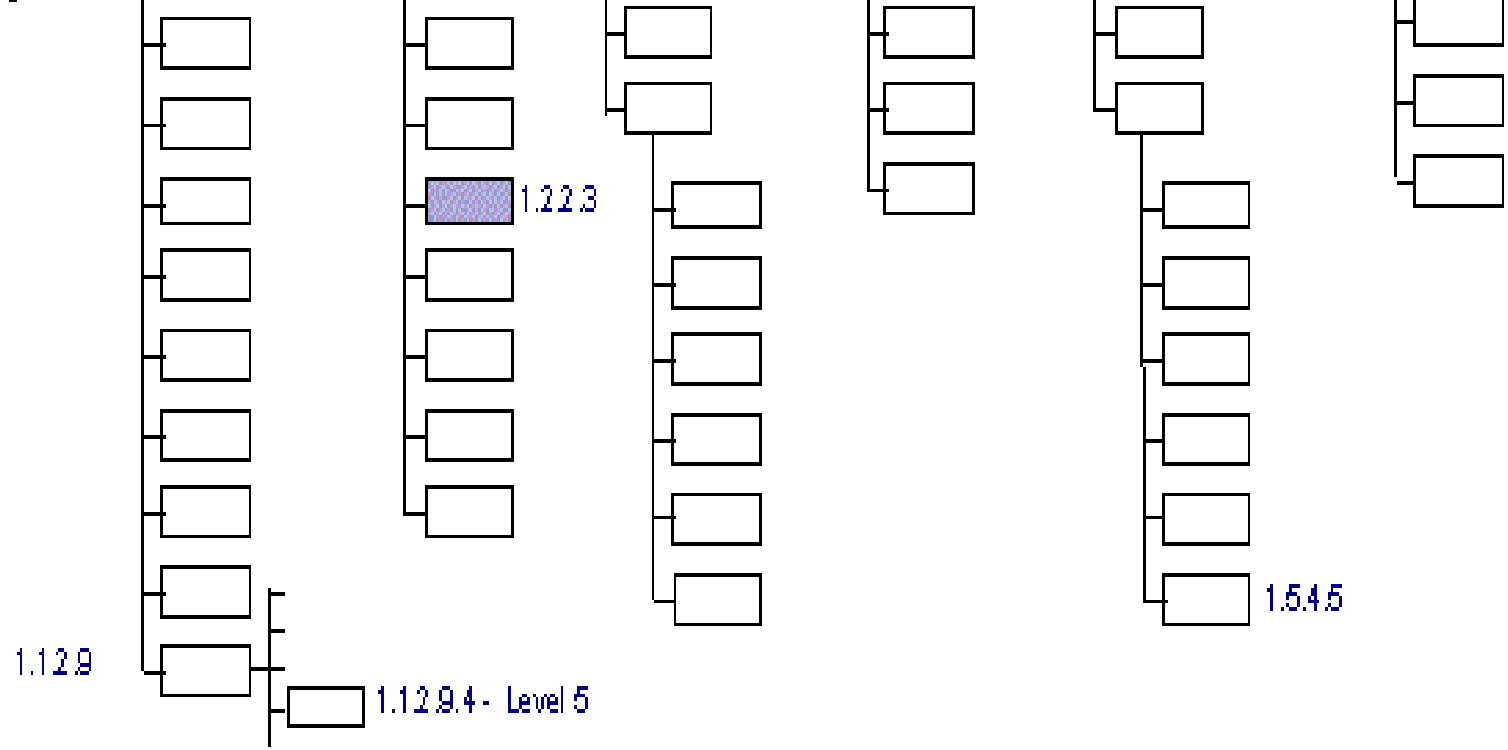
Level 2



Level 3

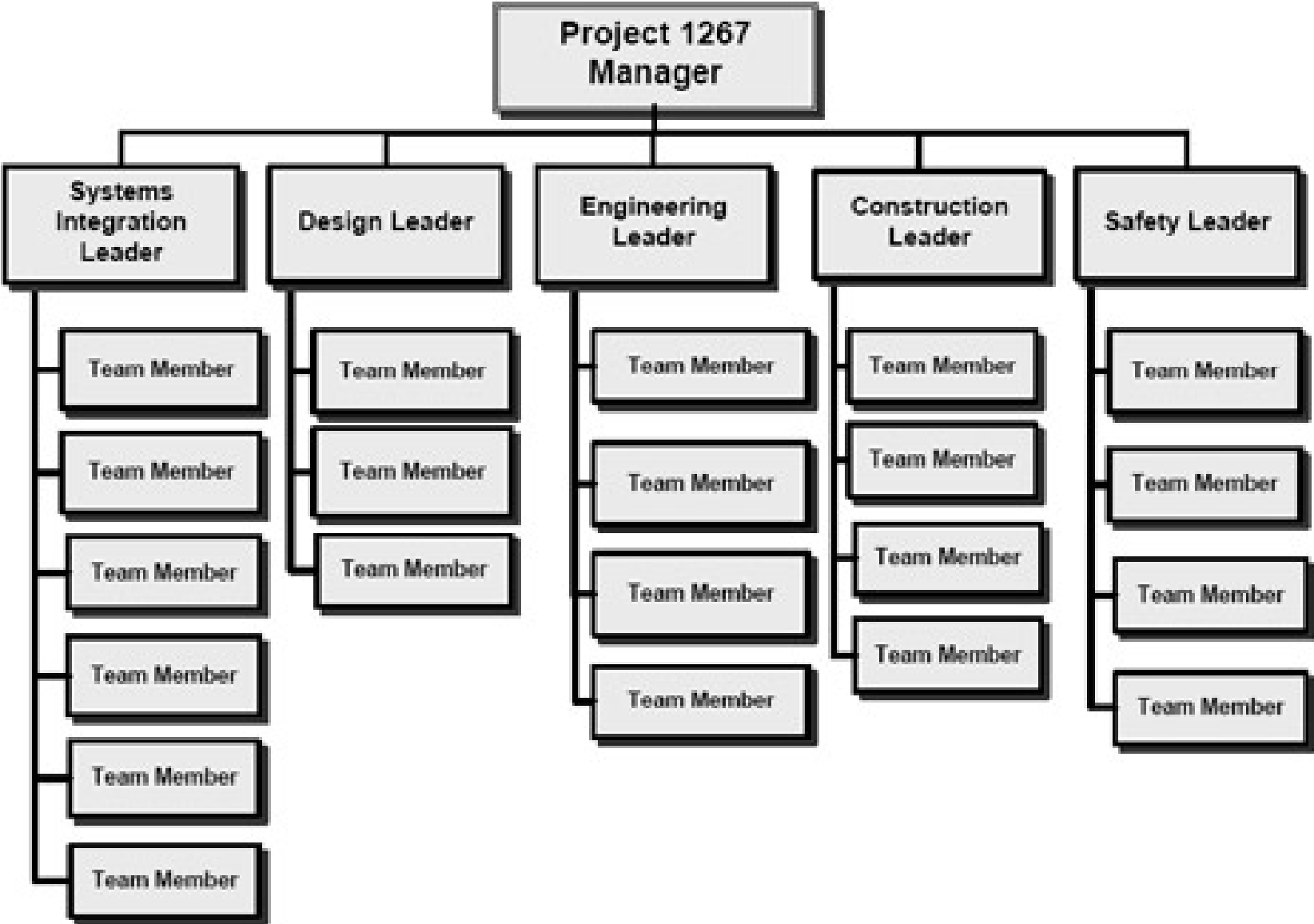


Level 4

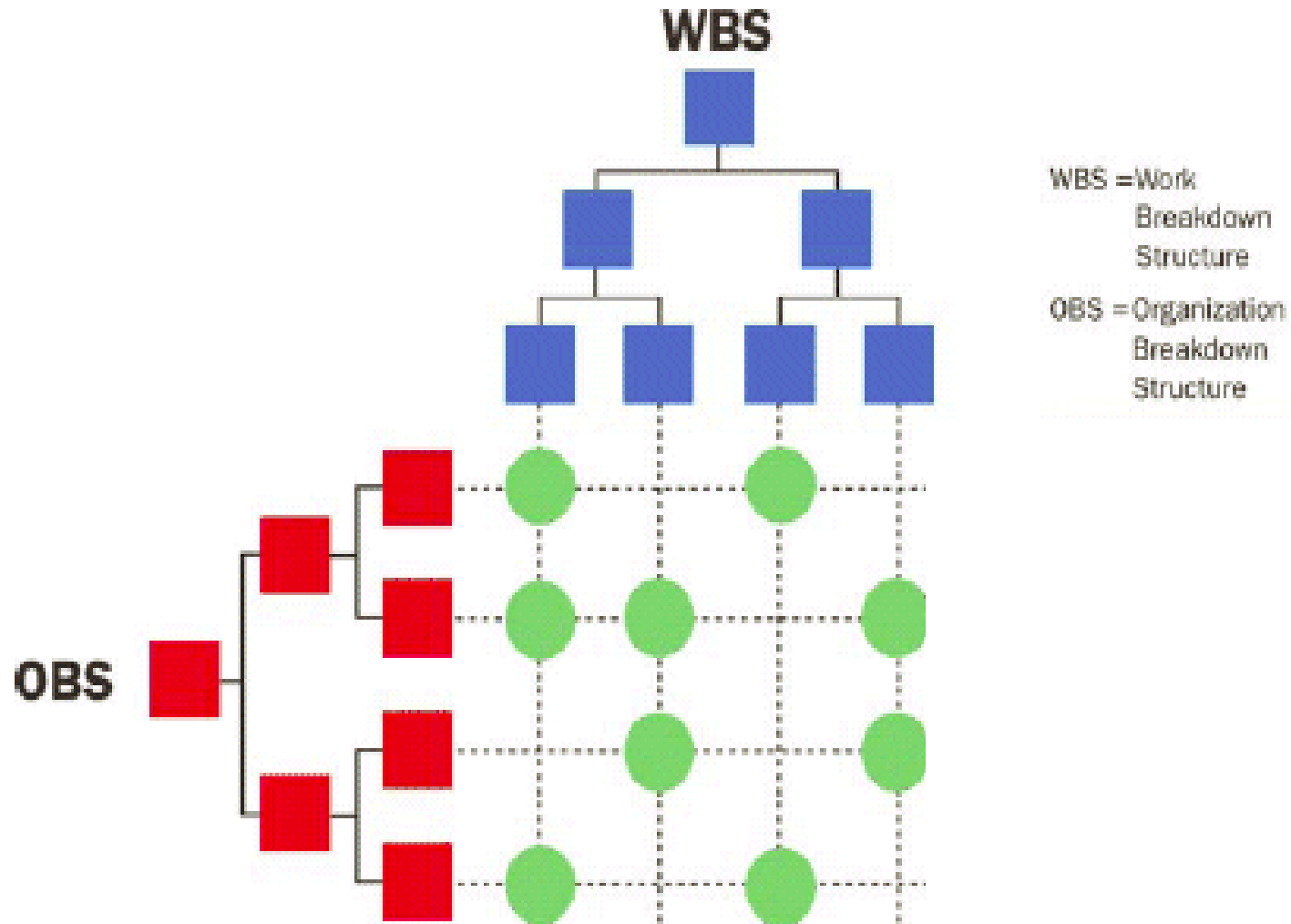


OBS

- Identifies the team structure for carrying out the work
- All the people who are going to do the work



Combine WBS and OBS



Milestone Plan

- Milestones are concrete evidence of progress
- They are **primary checkpoints** to see how well your project is doing and what it costs
- Not every task completion date in your project will be a milestone
- **But every milestone should be tied to a deliverable**
- Milestones should be met on time

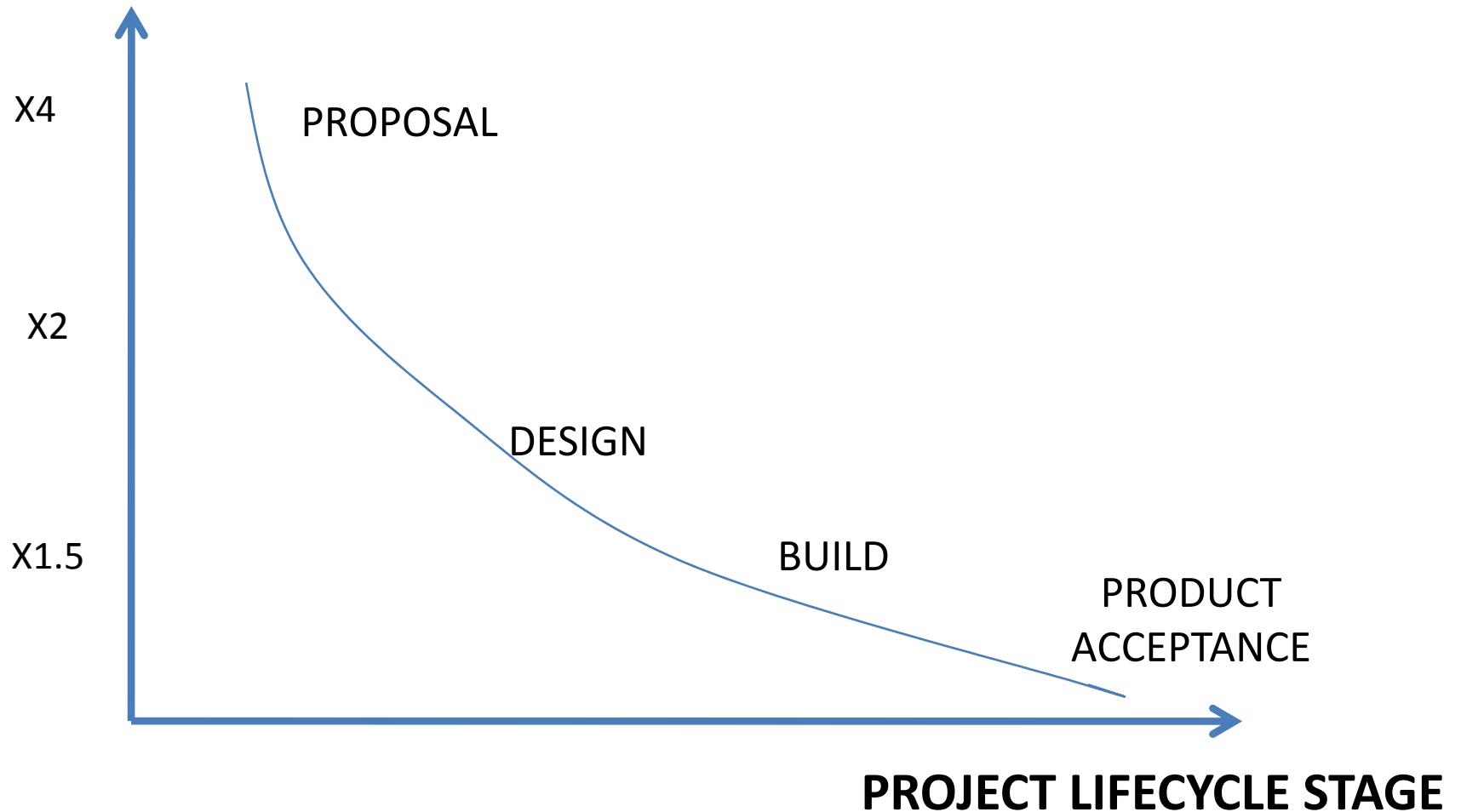
Project Estimation

Estimation Principles

- Prediction of project costs, resources and durations
- Estimates are required for strategy planning, capital budgeting, project budgeting, project scheduling and project control
- The process of estimating maybe carried out several times during a project. Each providing greater accuracy and confidence than the one before

Accuracy by lifecycle stage

COST RANGE



Estimation Accuracy

REQUIREMENTS  ESTIMATE

- Proportional to:
 - Clearly defined and stable scope (WBS)
 - Known specification
 - Expert judgment available
 - Normal conditions

Useful guidelines for Estimating

- Agree of scope and quality for product
- Agree tolerances
- Relate estimating objectives to project control requirements
- Beware of estimation limitations
- Review estimates frequently
- Maintain accurate historical data

Estimation Pitfalls

- Misinterpretation of statement of work
- Omissions or improperly defined scope
- Poorly defined or optimistic schedule
- Inaccurate work breakdown structure
- Failure to account for risks
- Failure to understand or account for cost escalation and inflation
- Failure to use correct estimation technique

Estimation Techniques

- **Ballpark** – made only when vague information exists and when all details of the work have yet to be decided.
- **Analogy**- uses actual cost of a previous , similar project as a basis for current project.
- **Parametric**- this involves using project characteristics such as weight, volume, lines of software code, hours of contact and so on to predict project costs

- **Top-Down-** senior management sets budget, these are often fixed before detailed planning has taken place.
- **Bottom-Up (Definitive)-** estimating cost of individual work items then rolling up the individual estimates to get a project total. The cost and accuracy is generally higher than other techniques. Basically it utilize the WBS to develop a Cost Breakdown Structure (CBS).

Estimation Methods in the IT Industry

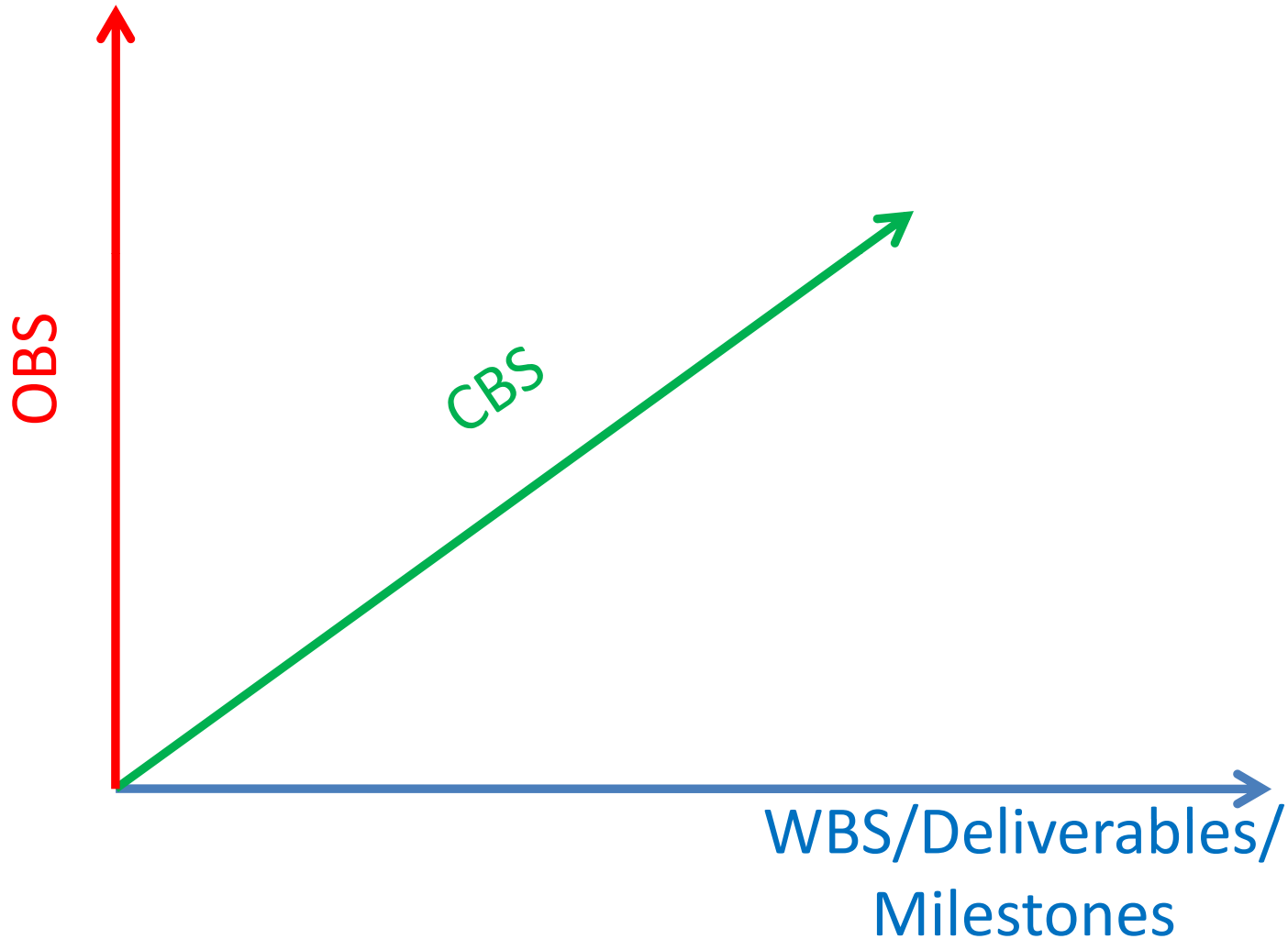
- COConstructive COst MOdel (COCOMO) II
- COCOMO II estimates project cost, derived directly from **person-months effort**,
- IT assumes the cost is basically dependent on total physical size of the Software, expressed in thousands single lines of code (KSLOC)
- $\text{Effort} = 2.94 * \text{EAF} * (\text{KSLOC})^E$

Where

EAF Effort Adjustment Factor

E Exponent scaling factor

Cost Estimation



Cost Elements

- Labour
- Materials
- Plant and Equipment
- Subcontract
- Management
- Overheads and Administration
- Fees and Taxation
- Inflation
- **Contingency**
- **Financing**

Elements of Costs

Maylor (2005, pg. 162)

