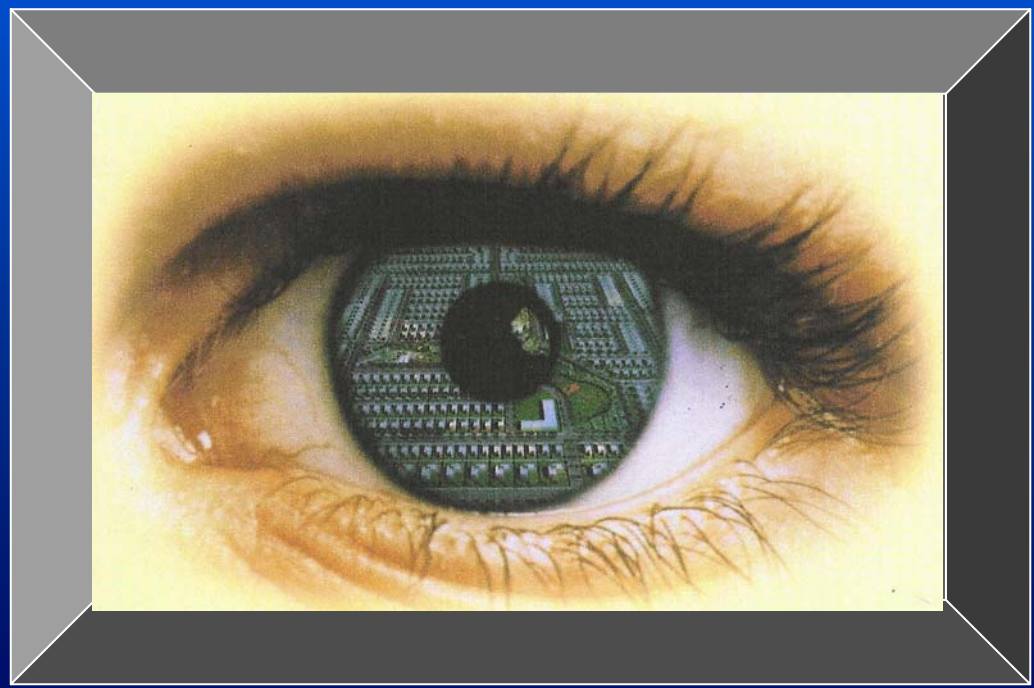
VE

Definition (s)



Value Engineering

A Systematic team effort aimed at improving the value as well as optimizing the life cycle cost (LCC)

Value Engineering is …

A teamwork that focuses on improving the value via analyzing Functions.

Value Engineering

Improving (upgrading) Value is Customizing Quality and optimizing the life cycle cost (LCC)

Value Engineering *(Larry Miles)*

An organized effort directed at analyzing functions of goods, services to achieve those necessary functions and essential characteristics in the most cost-effective manner consistent with the customer requirements and expectations

Value Engineering *(New)*

An organized team effort aimed at analyzing Functions and Quality of projects (goods, services and processes) in order to generate practical cost-effective alternatives that meet customer requirements.

الهندسة القيمية هي:

جهد جماعي منظم لتحليل الوظائف والجودة لغرض الخروج ببدائل عملية ذو تكلفة مناسبة وتلبي متطلبات ورغبات المستفيد

Value Engineering

Improve Value

تحسين القيمة

تفصيل الجودة

Customize Quality

Not always

Improving Quality

ترشيد النفقات

Optimize Cost

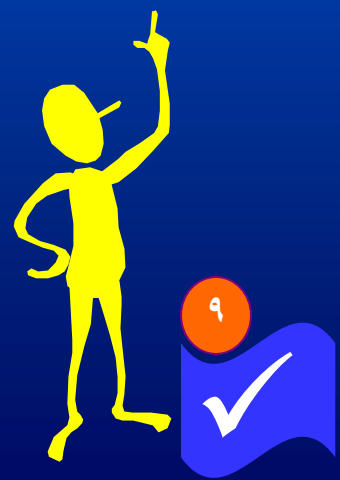
Not always

Reducing Cost

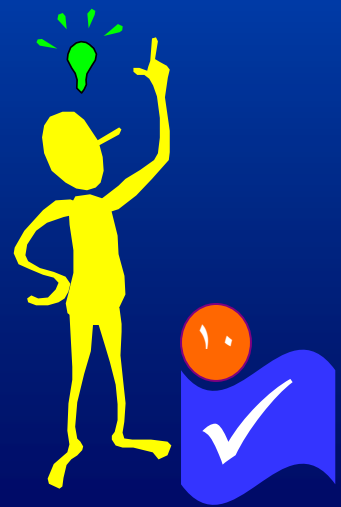
Value Engineering

Is actually coming up

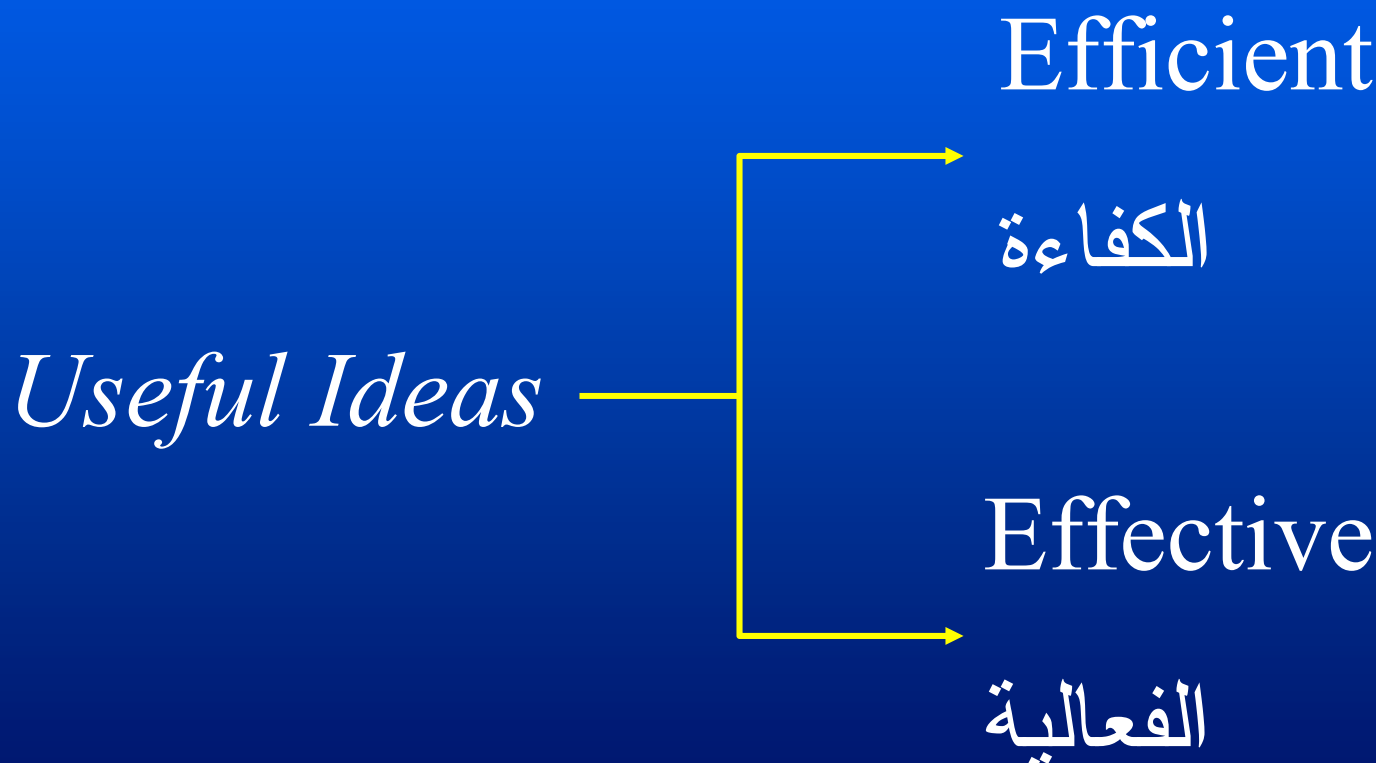
with …



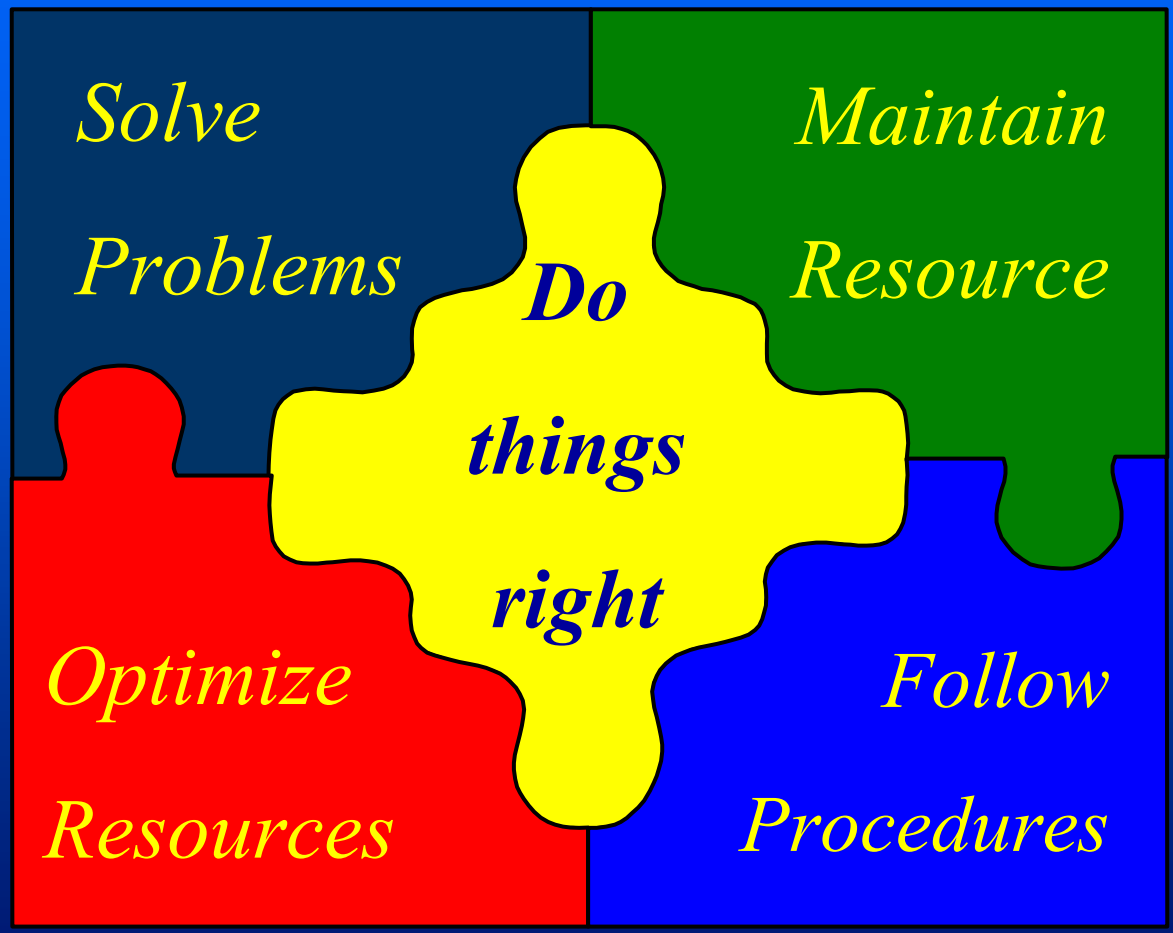
الهندسة القيمية هي عملية الخروج بـ



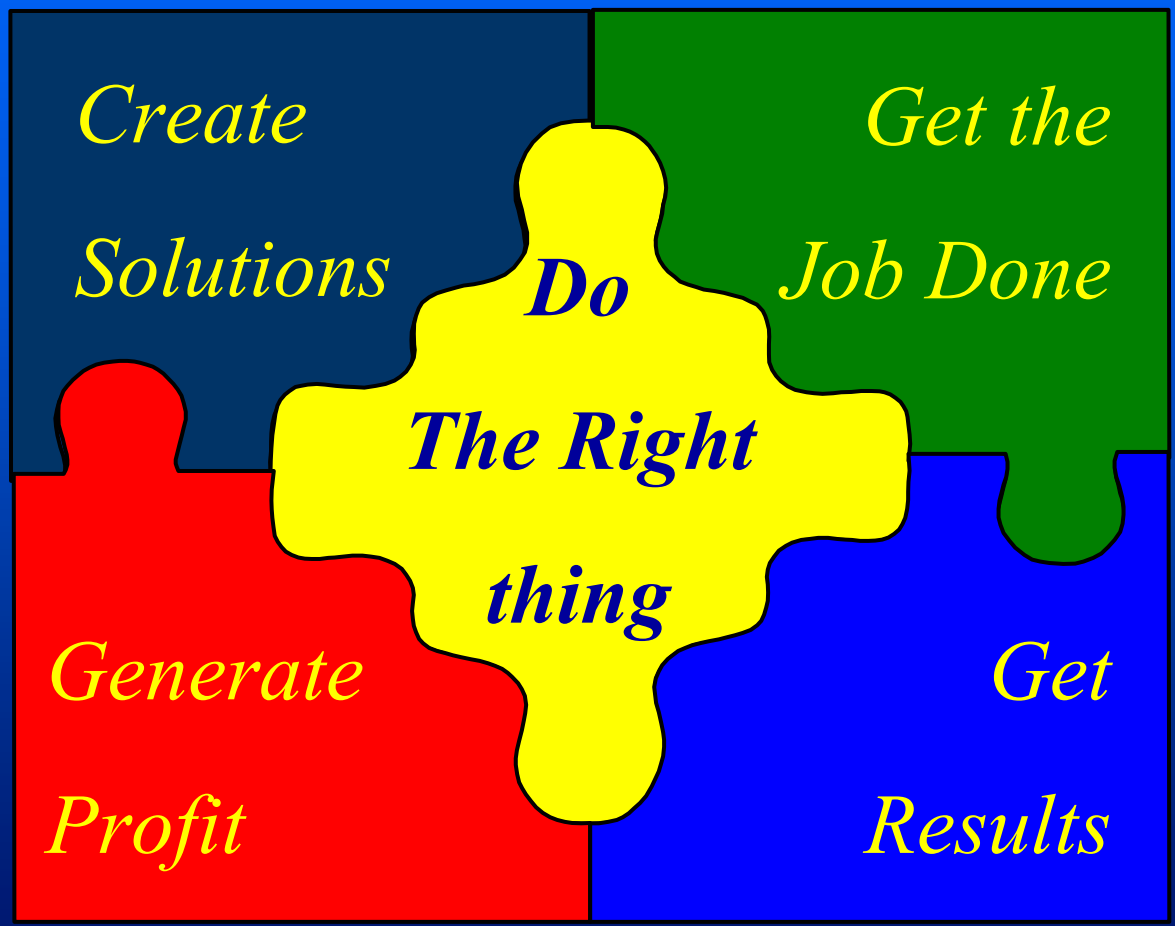
Useful ideas have to be :



Efficiency (Process) الكفاءة (العمليات)



Effectiveness (Results) الفعالية (النتائج)



Efficiency vs. Effectiveness

Useful Idea

Efficient

Do things right

عمل الأشياء بشكل صحيح

Effective

Do the right thing

عمل الشئ الصحيح

$$V = \frac{Function\ ,\ Quality}{Cost}$$

Life Cycle Costing

Cost Analysis

VE

LCC

Life Cycle Cost

Total Cost

العوامل التي تؤثر على دقة التكاليف

- عدم معرفة المتطلبات بشكل كامل
- عدم دقة أعمال التخطيط الأولية والتصميم
- عدم وضوح أو وجود جداول التنفيذ
- عدم حصول مقدري التكلفة على المعلومات المطلوبة
- طرح كثير من البنود بشكل إجمالي (Lump Sum)
- الاعتماد على بيانات من مشاريع سابقة

العوامل التي تؤثر على دقة التكاليف

- عدم اكتمال المشروع
- قلة الوقت المخصص لتقدير التكلفة
- عدم وجود أو نقص في وثائق التصميم
- حجم المشروع
- عدم تحديد النظم الخاصة
- الموقع الجغرافي
- طبيعة التربة

Life Cycle Costing

3 kinds of costs

Running

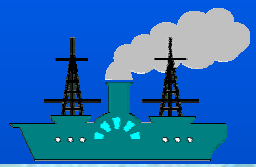
Cost

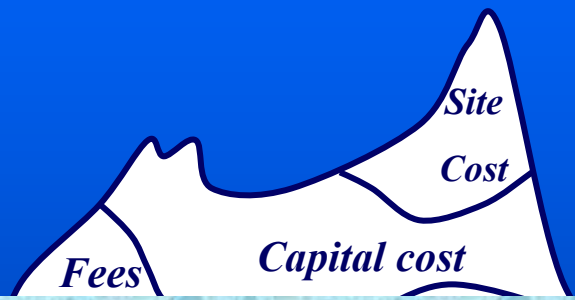
We use the Present Worth Analysis

Running , Follow on or Ownership cost

Are all the associated cost of running the facility. It covers energy, maintenance, repair replacement, staffing.. etc.

Where are the " Hidden Costs " ?





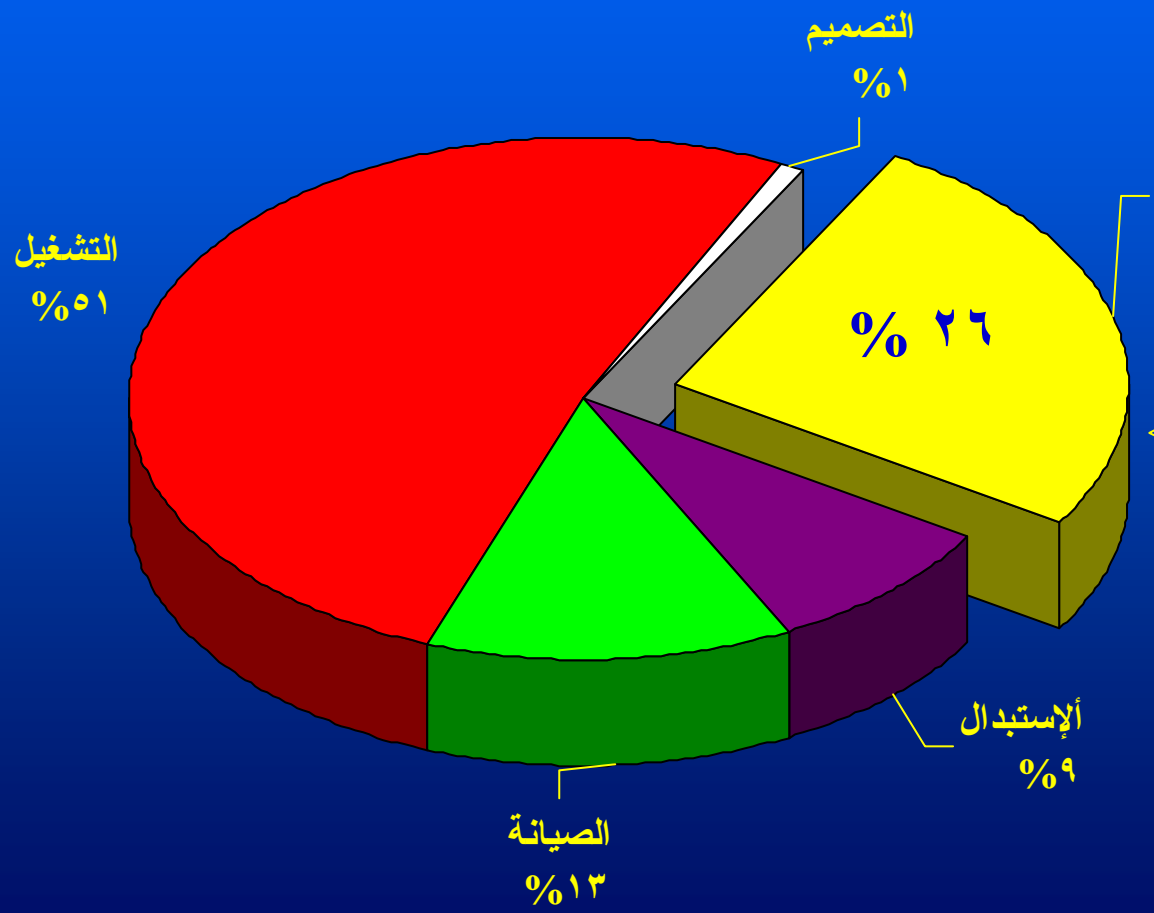
أين التكاليف الغير مرئية ؟

التكلفة الكلية

المستفيد

التكلفة الكلية لـ

مبنى تجاري ، العمر الافتراضي = ٢٥ سنة

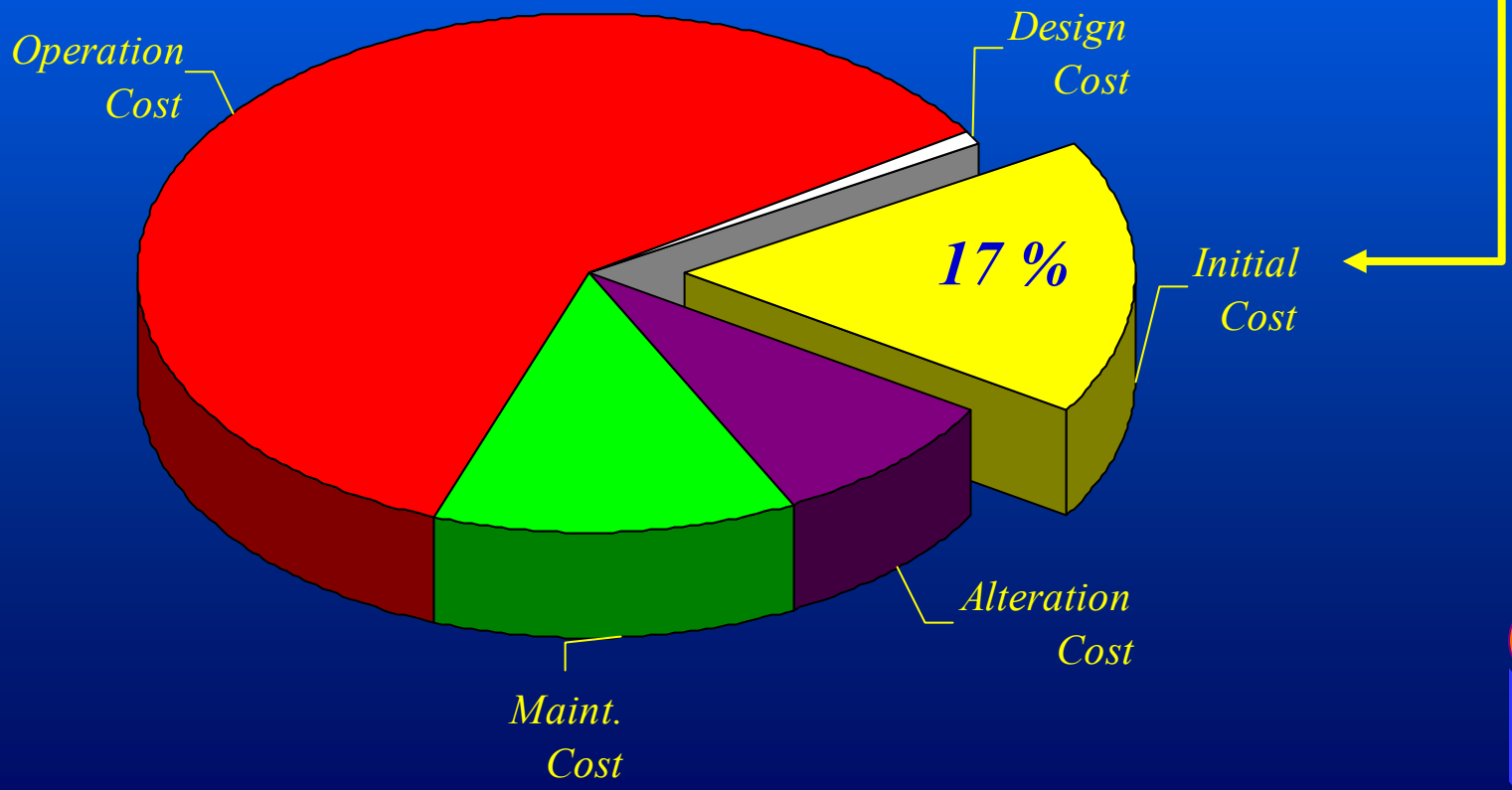


١٦٥ مليون ريال سعودي

Life Cycle Costing

For a 160 bed Hospital - Life span is 25 years

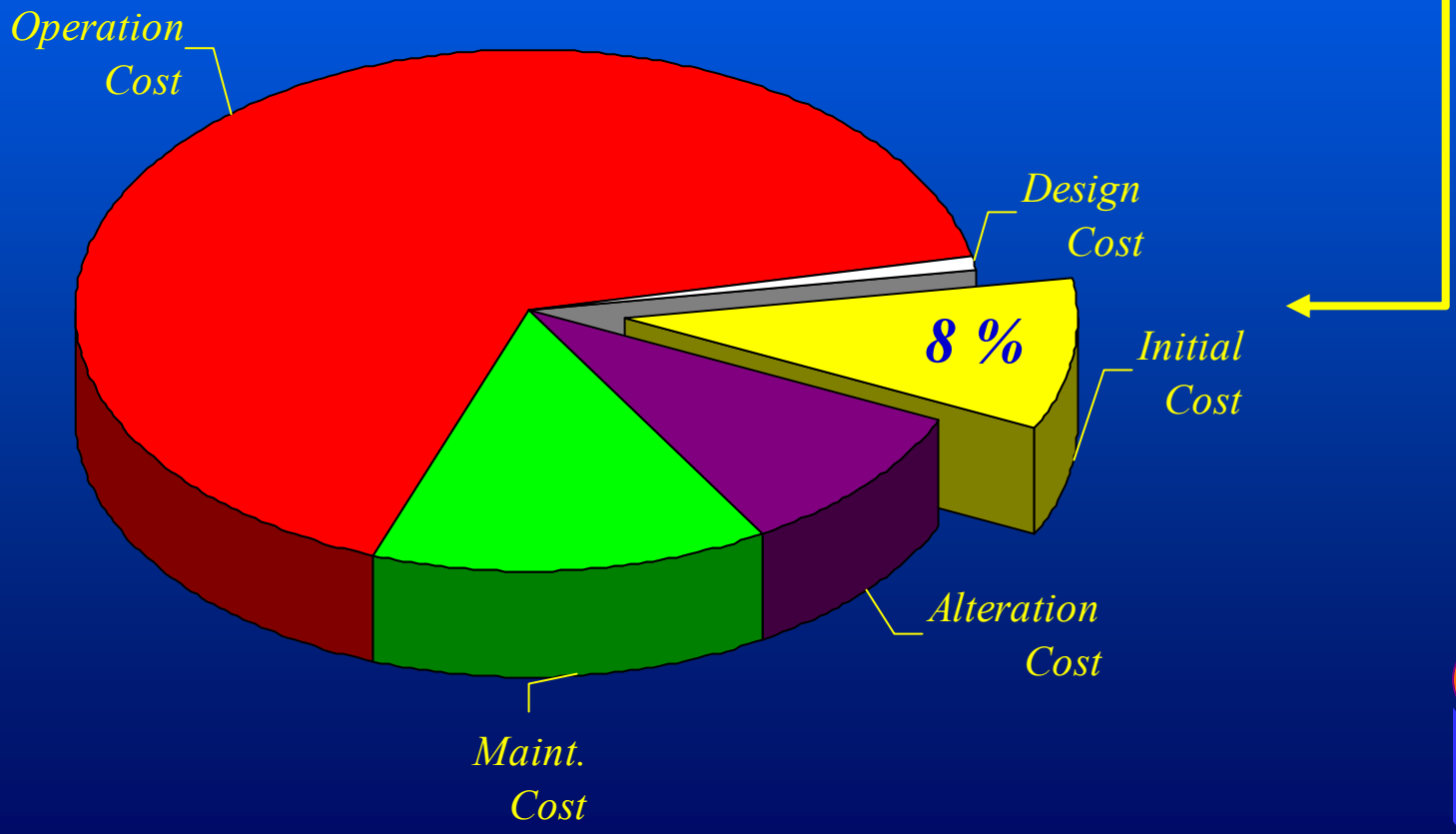
Case 1 : Initial Cost = SR 124 Millions



Life Cycle Costing التكلفة الكلية لـ

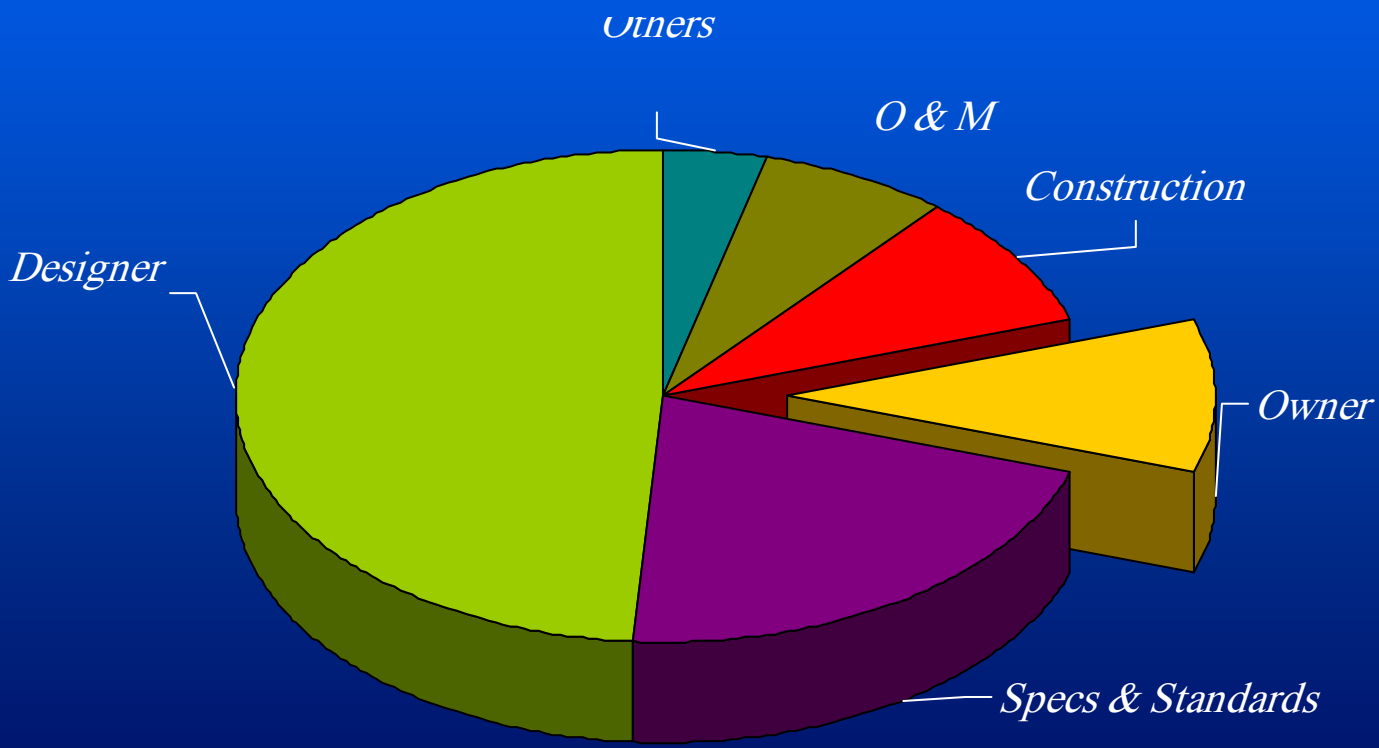
300 Bed Hospital - Life span is 25 years

Case 1 : Initial Cost = SR 365 Millions

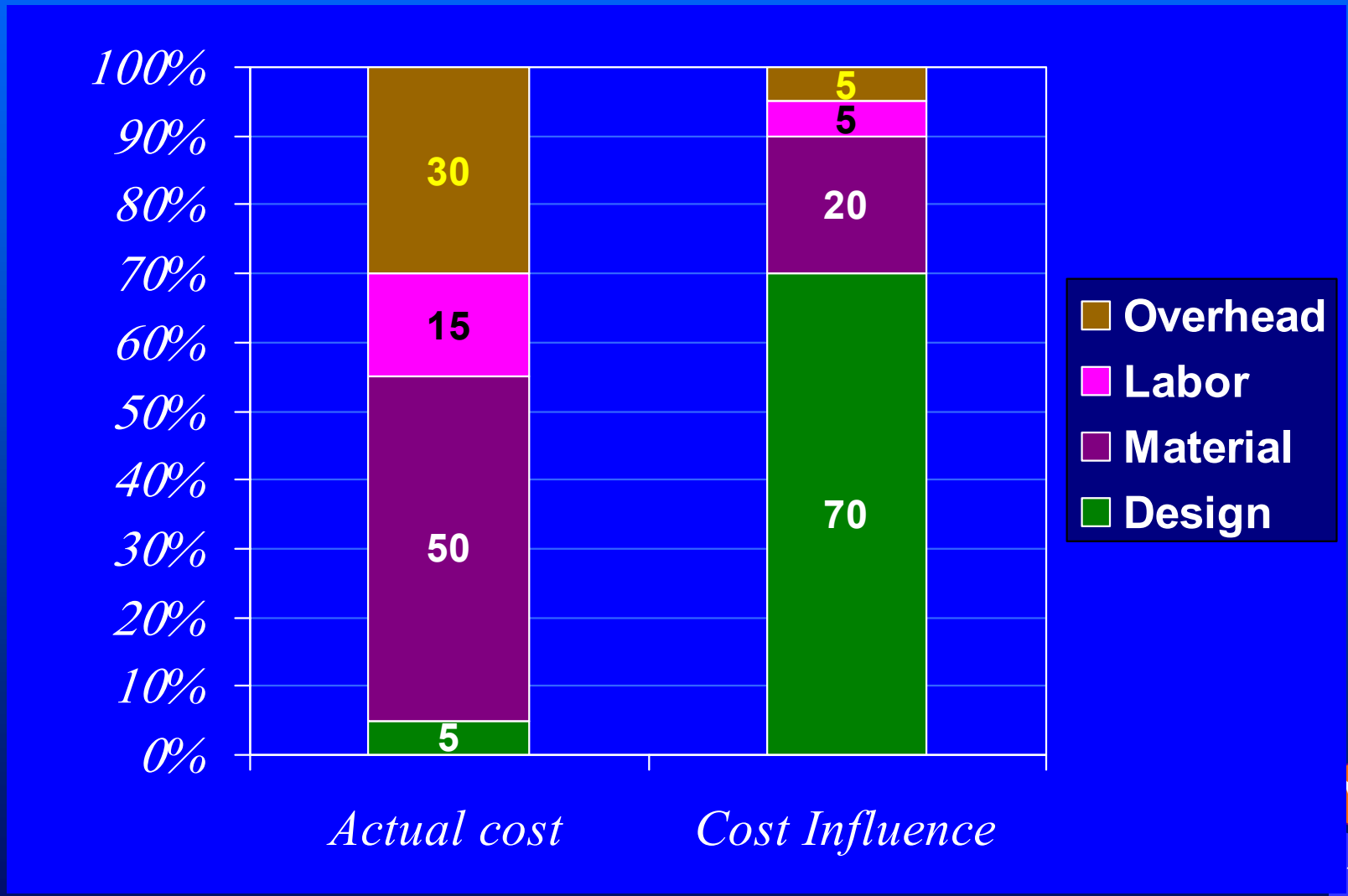


Level of Influence on Cost

Who influence the total cost !



Level of Influence on Cost



Sources : 6 sigma Academy

Life Cycle Cost التكلفة الكلية

Revenues

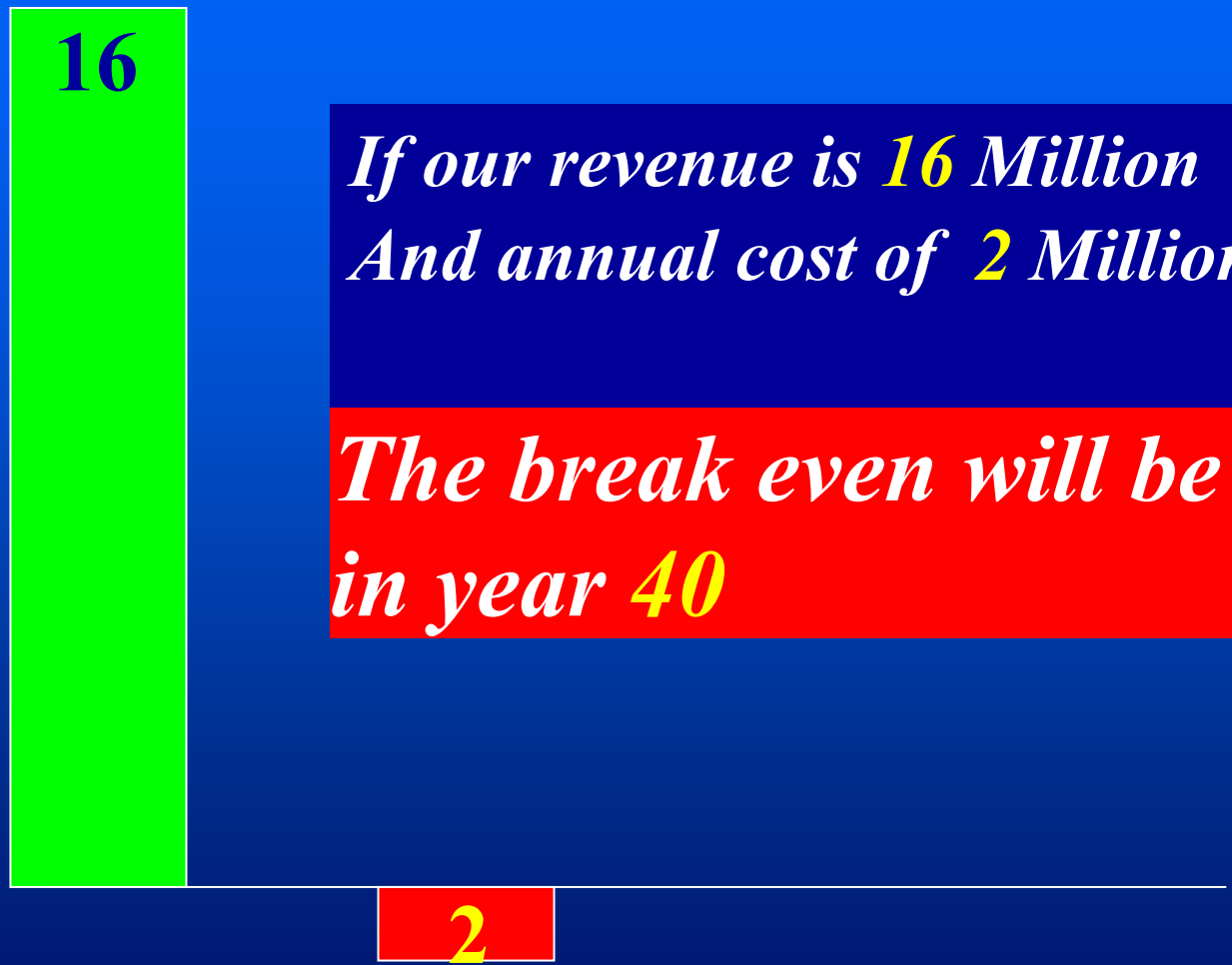
For an Economical
Life Span of 25 years
And Discount rate of 6%

Our annual Net is 6.3

Annual Expense

Life Cycle Cost التكلفة الكلية

Revenues

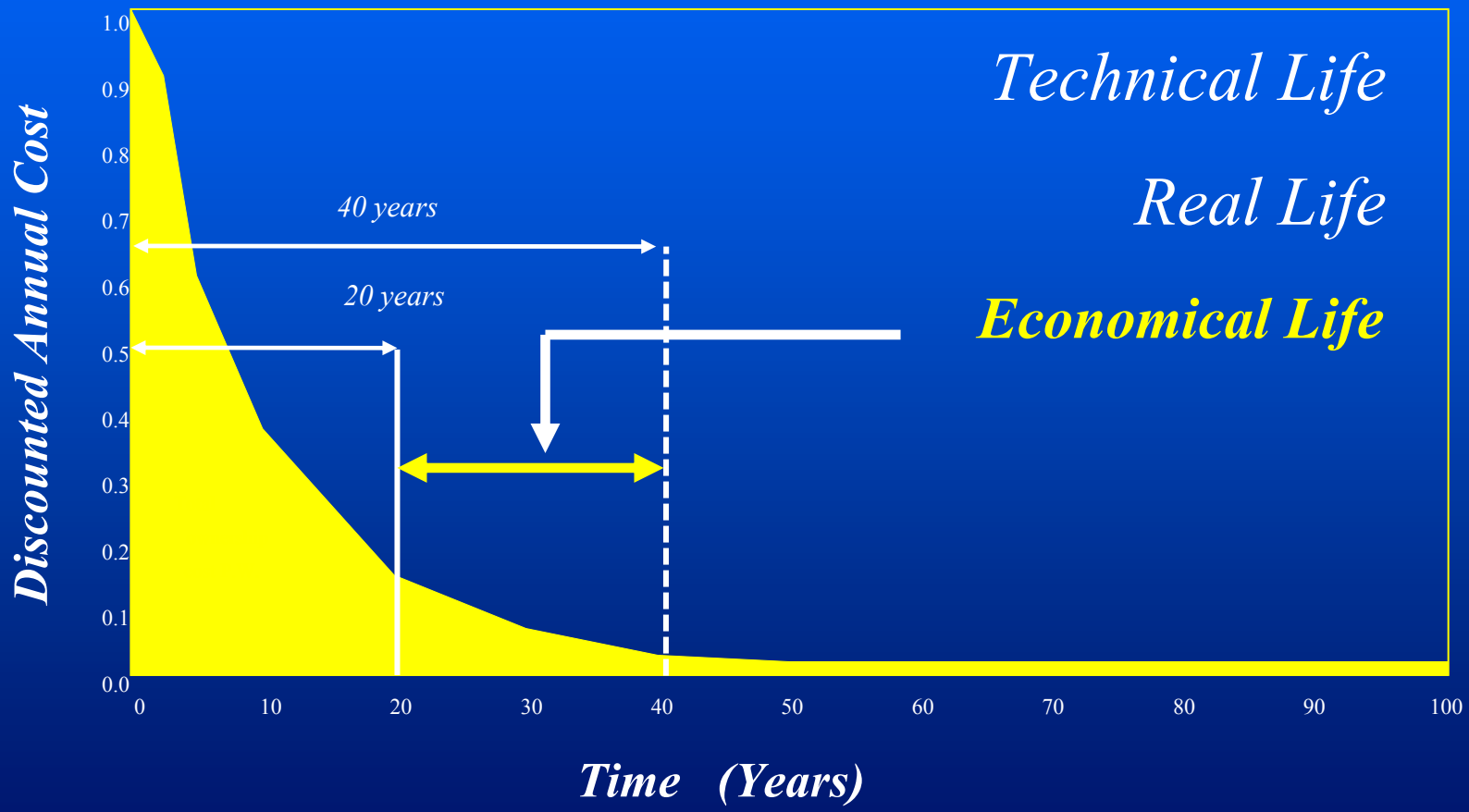


If our revenue is 16 Million
And annual cost of 2 Million

The break even will be in year 40

Annual Expenses

Recommendation Economic Life Span



Source : LCC For Design Professionals

Life Cycle

Life Cycle

Life Cycle Costing

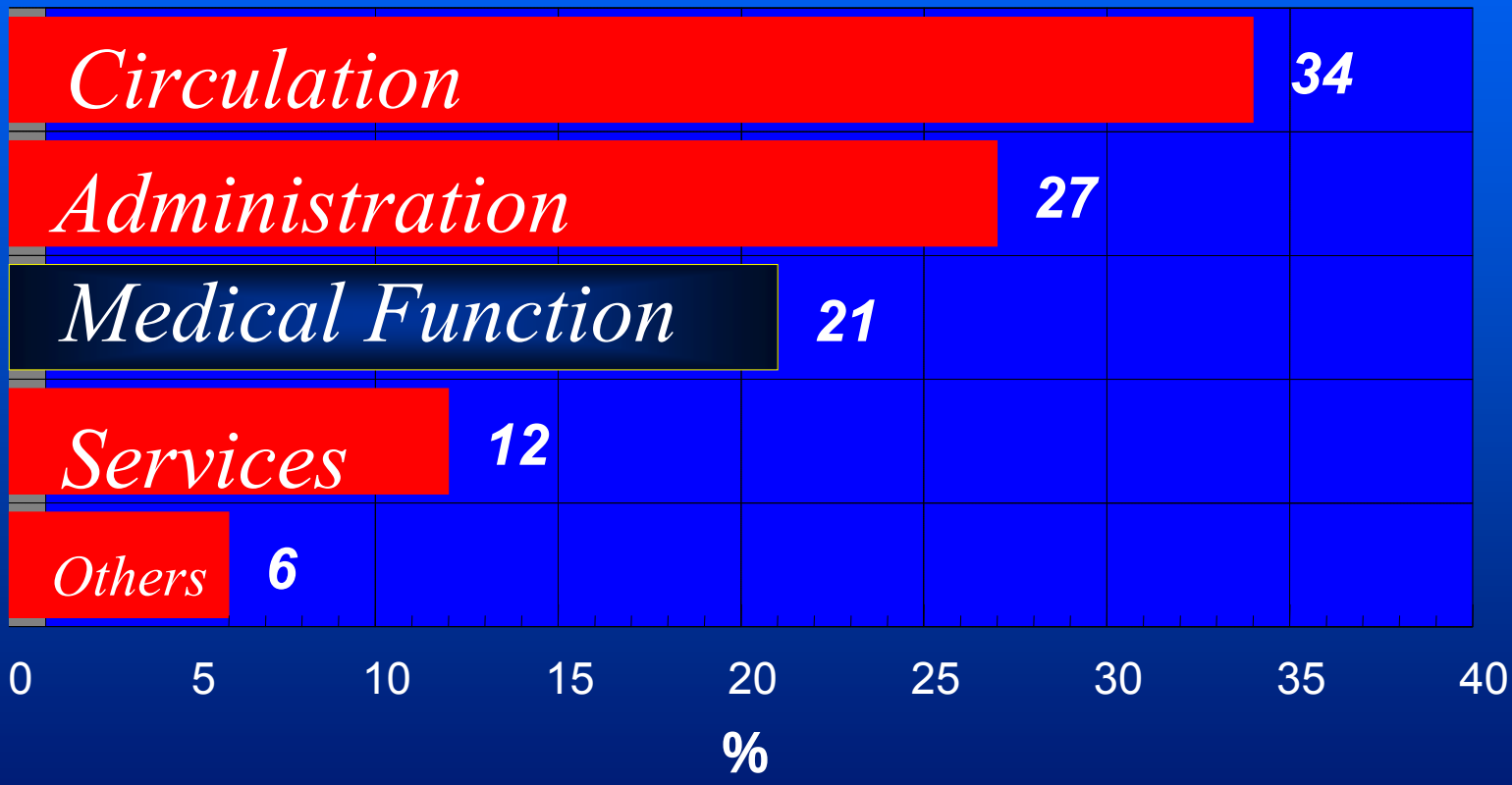
LIFE CYCLE COST (Present Worth Method)									
Project									
PROJECT LIFE CYCLE (YEARS)									
DISCOUNT RATE (PERCENT)				Option 1		Option 2		Option 3	
Initial Costs				Estimated	PW	Estimated	PW	Estimated	PW
			Sub-total Initial Cost (IC)						
Single Costs		Year	Factor						
			Sub-total - Singel PW Costs						
Annual costs		Escl. %	PWA						
			Sub-total Annual (PW) Costs						
			Grand -Total Present Worth Life Cycle Costs						

التكلفة الكلية Life Cycle Costing

LIFE CYCLE COST (Present Worth Method)

Project:	***Three Projects***								
PROJECT LIFE CYCLE (YEARS)		**30**		ORIGIN		ALT. 1		ALT. 2	
DISCOUNT RATE (PERCENT)		**10%**		Project A		Project B		Project C	
Initial Costs				***Est.***	***PW***	***Est.***	***PW***	***Est.***	***PW***
A)	Construction cost			55,000	55,000	70,000	70,000	90,000	90,000
Total Initial Cost Impact (IC)					*55,000*		*70,000*		*90,000*
Replacement/Salvage Costs		Year	Factor						
A)	Repare for Projact 1	7	0.5132	5,000	2,565				
B)	Repare for project 2	11	0.3505			7,000	2,453		
C)	Repare for project 3	13	0.2897					8,000	2,317
D)	Maintenance for all projects	10	0.3855	4,000	1,542	6,000	2,313	8,000	3,084
G)	Maintenance for all projects	20	0.1486	4,000	594	6,000	891	8,000	1,189
	Salvage	30	0.0573	5,000-	286-	20,000-	1,146-	35,000-	2,005-
Total Replacement/Salvage PW Costs					*4,415*		*4,511*		*4,585*
Annual costs		Escl. %	PWA						
A)	Annual Maintenance	0%	9.4269	5,000	47,135	4,000	37,708	4,000	37,708
B)	Annual Revenue	0%	9.4269	3,700-	34,880-	8,000-	75,415-	13,000-	122,550-
Total Operation/Maintenance (PW) Costs					*12,255*		*37,708-*		*84,842-*
Total Present Worth Life Cycle Costs					***71,670***		***36,803***		***9,743***

Space distribution for a hospital in Riyadh



Can you believe it? …… It is true !!

The 3 Stages of the VM Study

The 3 Stages of the VM Study

Coordination
Data Preparation
Team Selection
Modeling

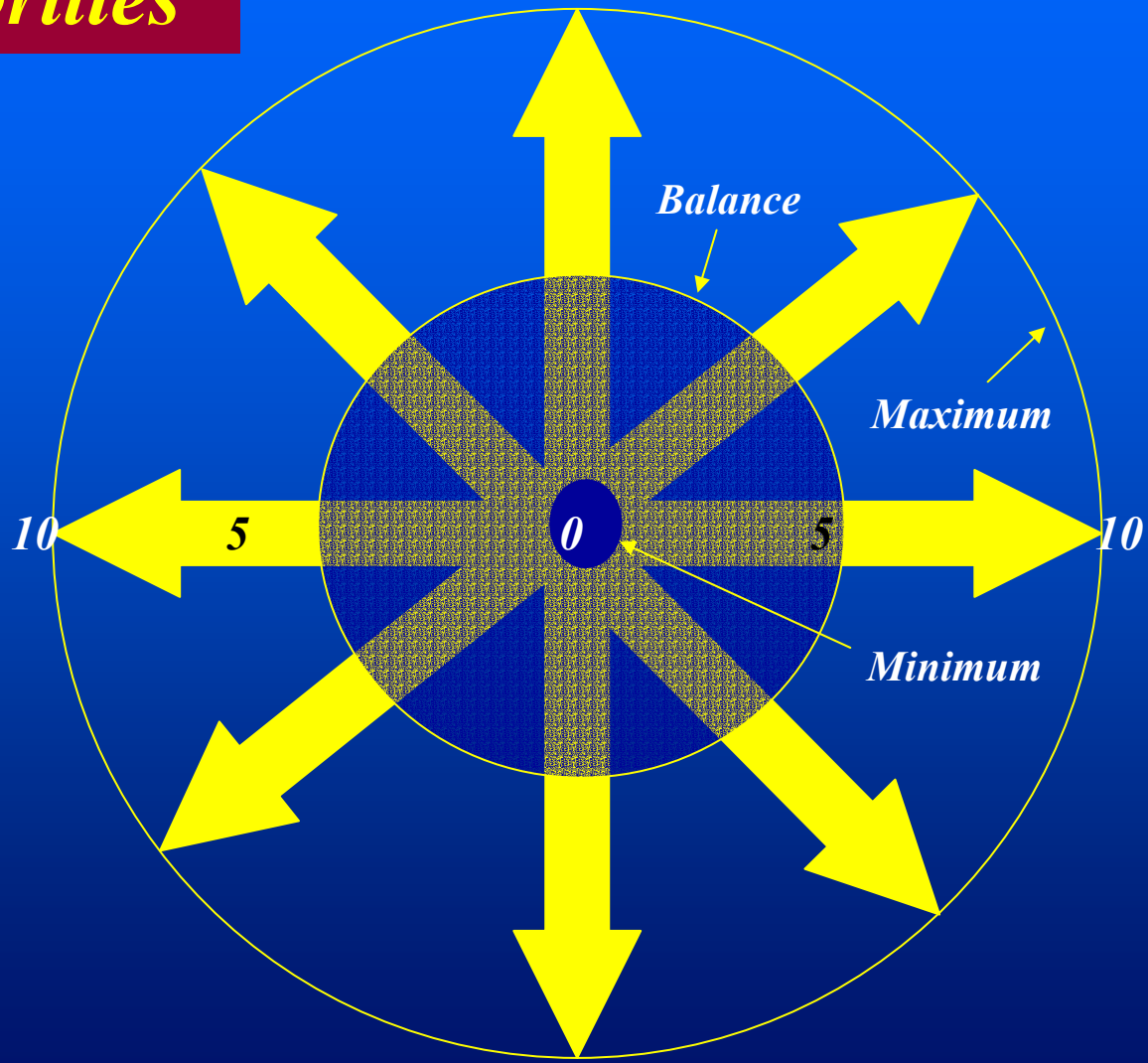
Pre-Study

الإعداد ، التخطيط، تحديد فريق العمل ، الجدولة

Preparation, Planning, Agenda

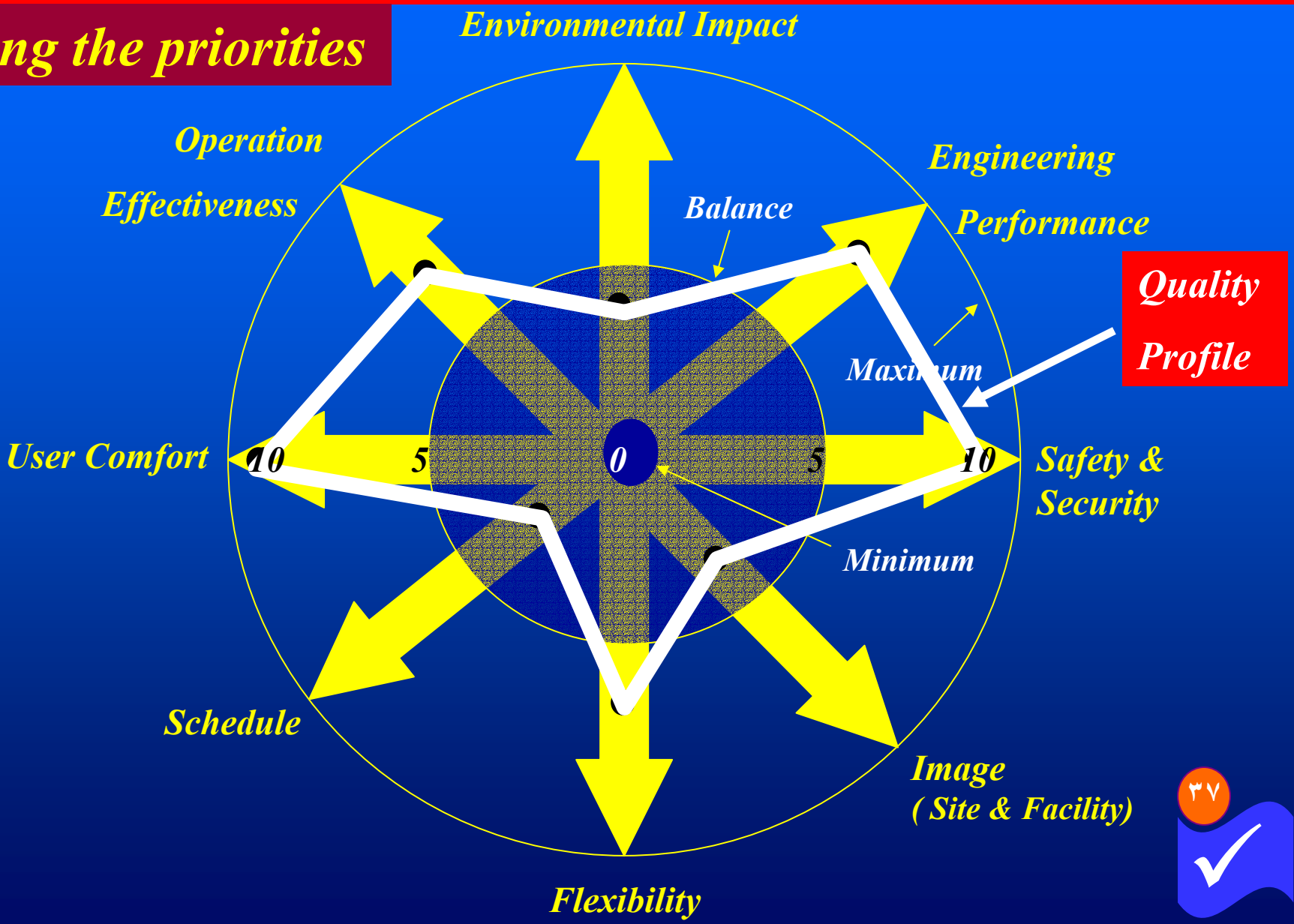
Quality Model (Star Diagram)

Setting the priorities



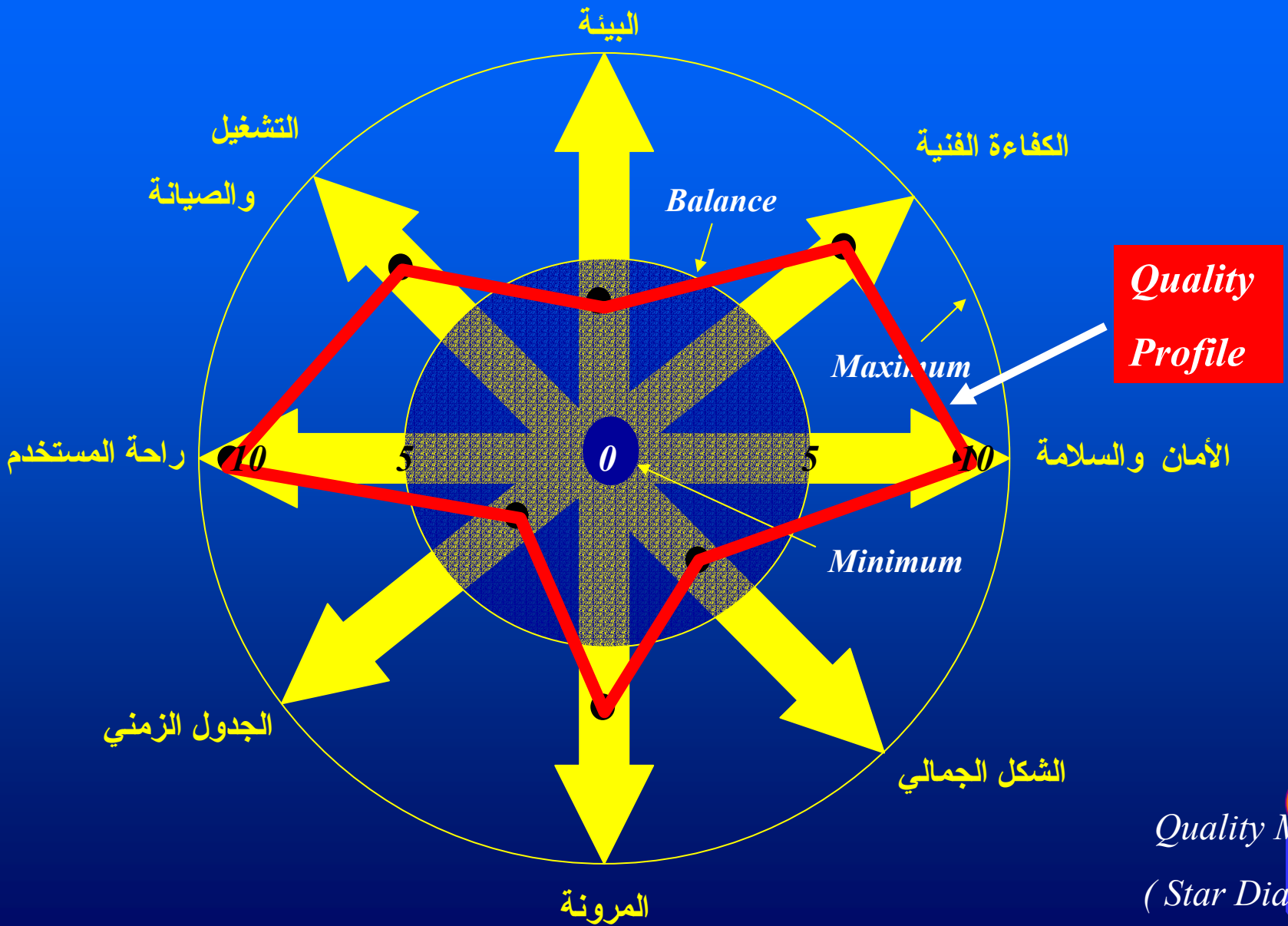
Quality Model (Star Diagram for a **Housing** Project)

Setting the priorities



تحديد أولويات الجودة

الأهم فالمهم



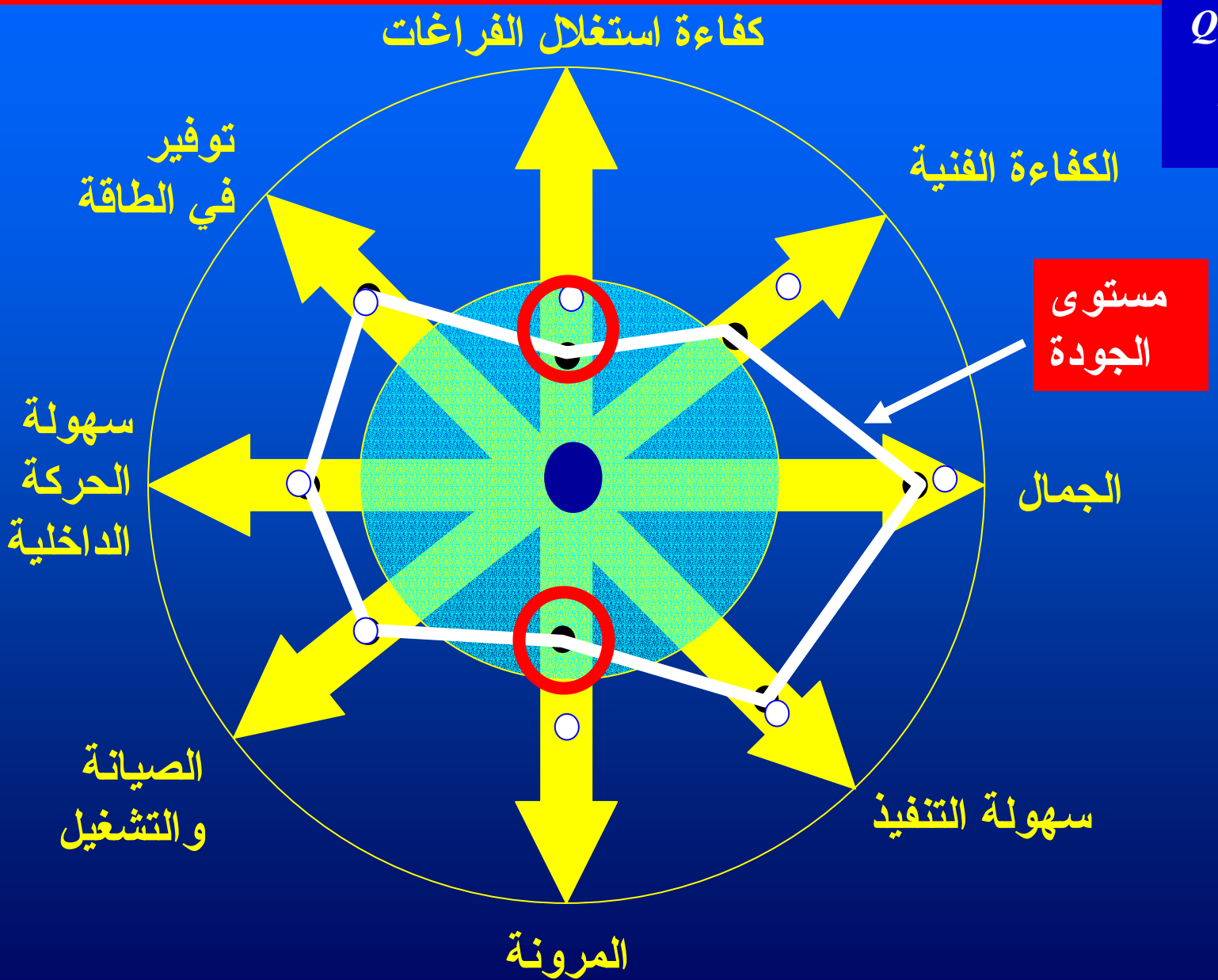
Quality Model

(Star Diagram)

تحديد أولويات الدراسة First thing First الأهم فالمهم

Quality Model

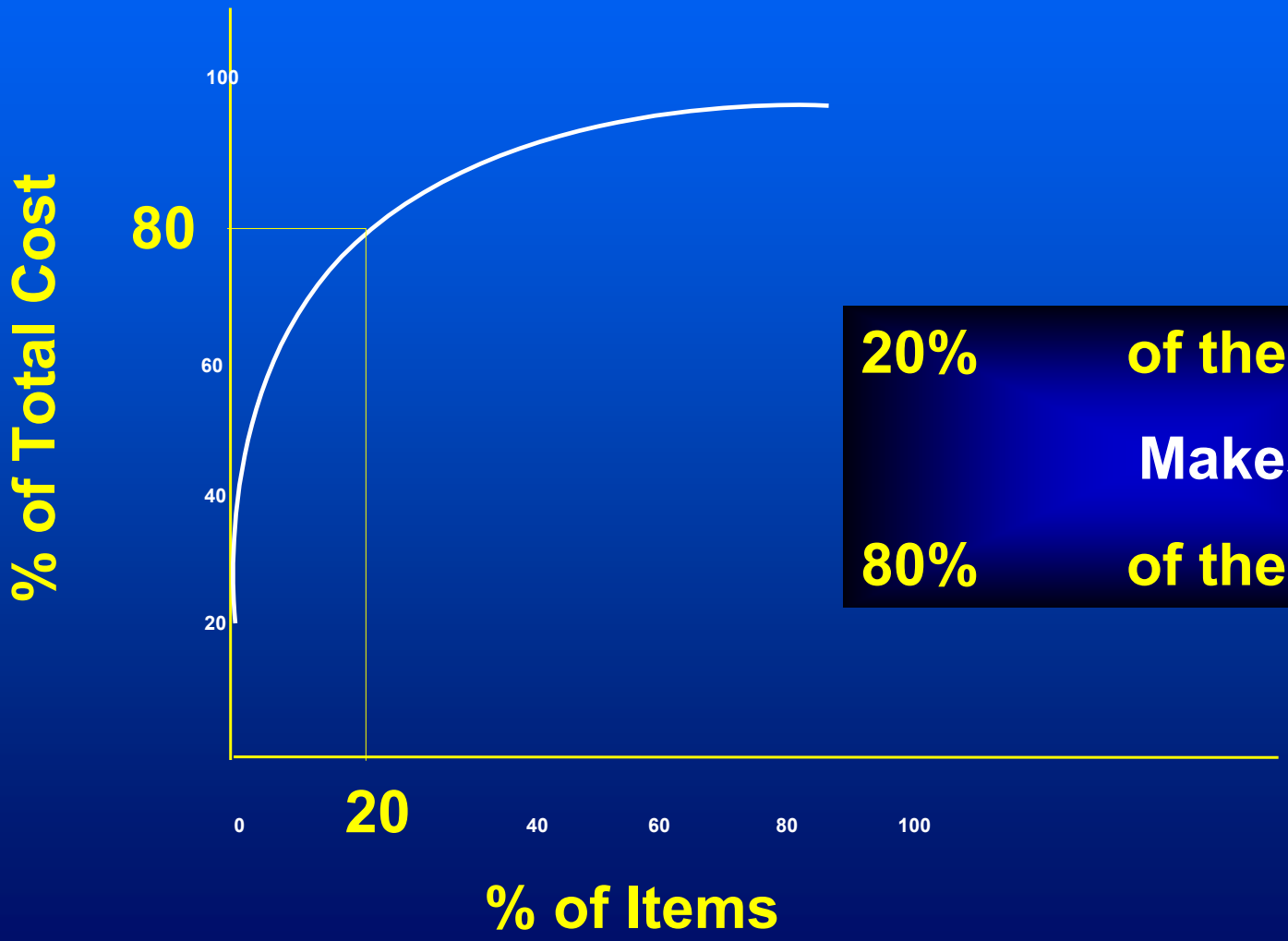
Setting the priority



إذا فشلت في التخطيط ...فأنت تخطط للفشل

Pareto's Law the 80/20 rule

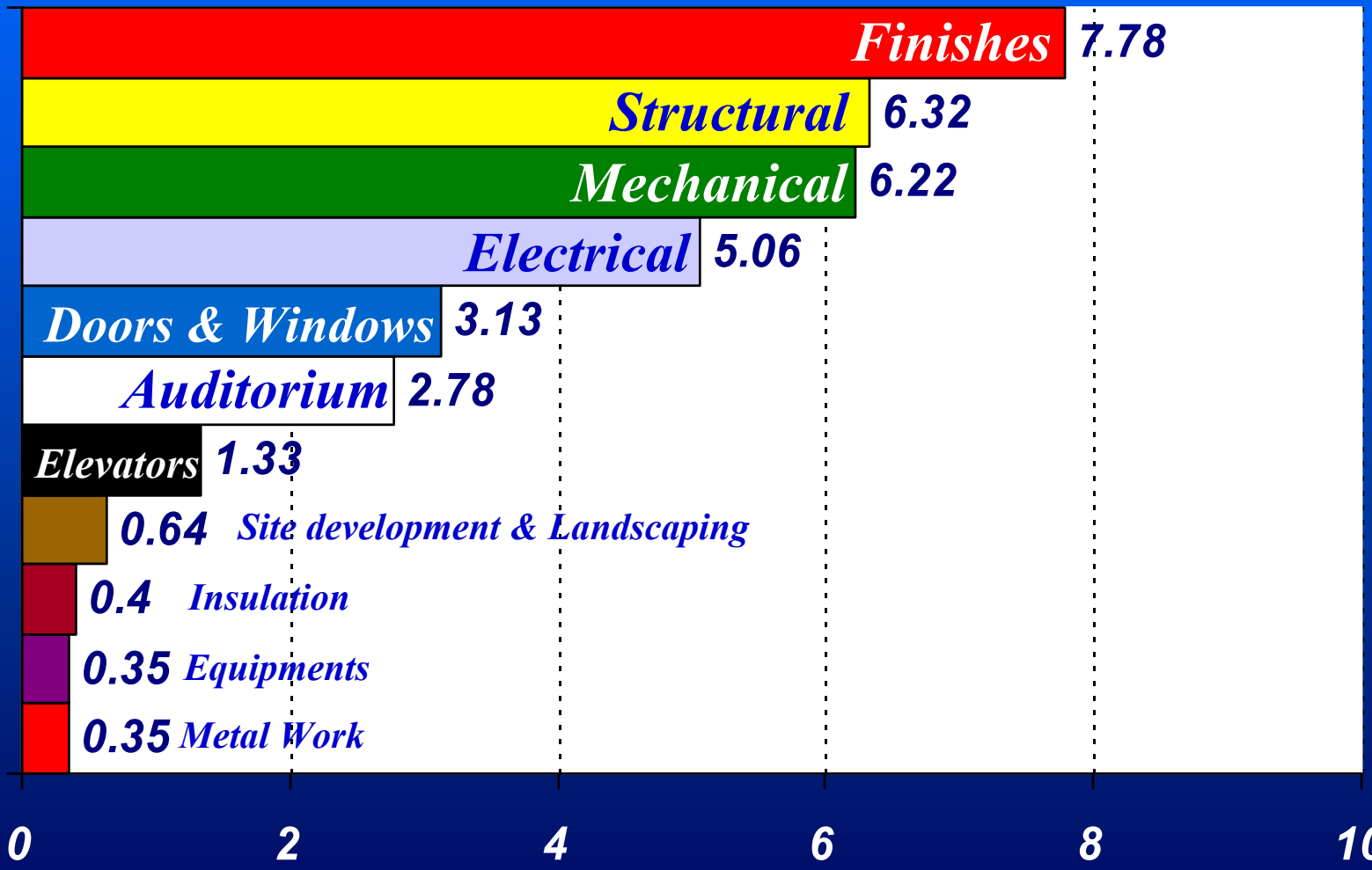
٨٠% من التكاليف تأتي من ٢٠% من الأجزاء



20%	of the items
	Makes up
80%	of the cost

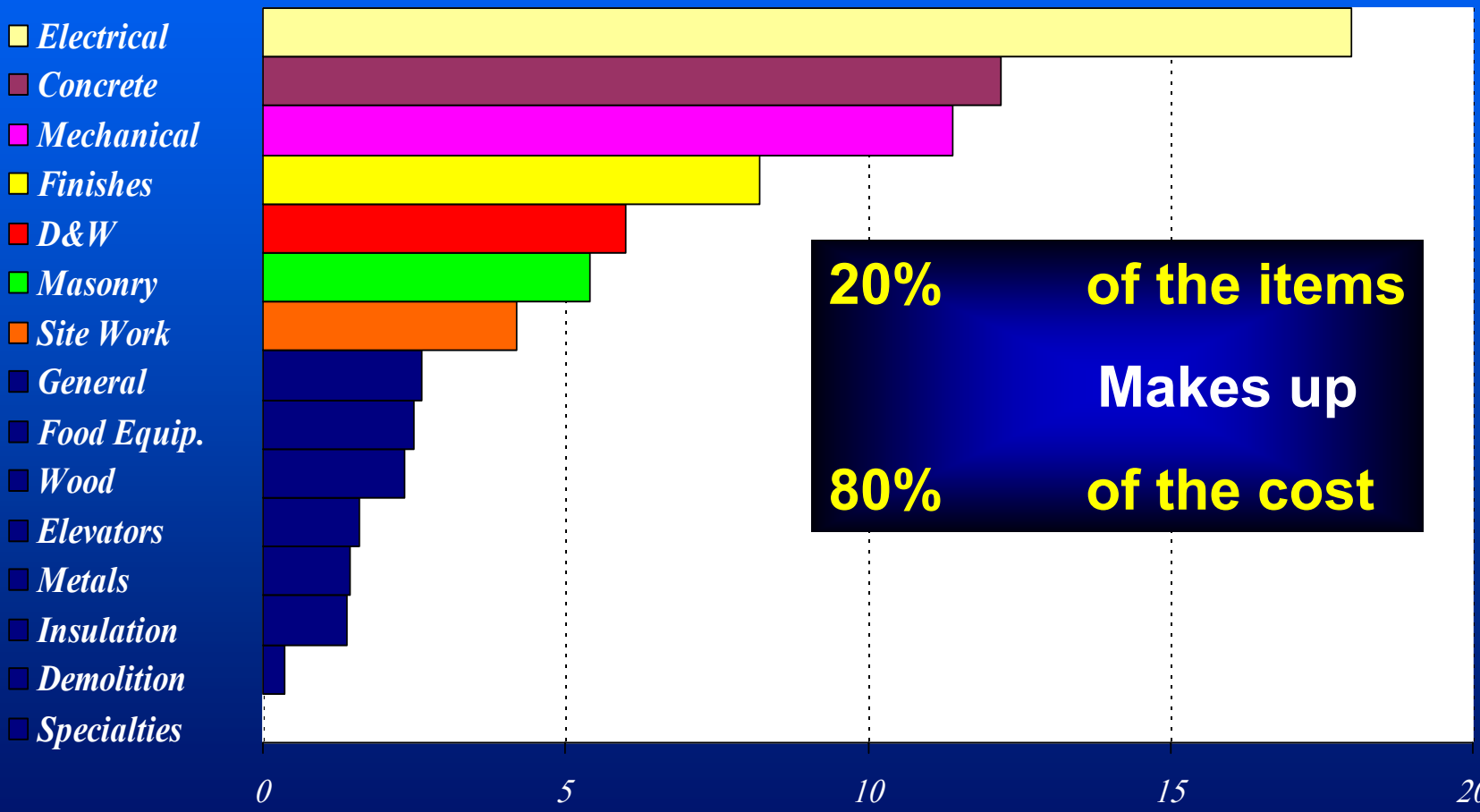
Pareto's Law the 80/20 rule

Office building



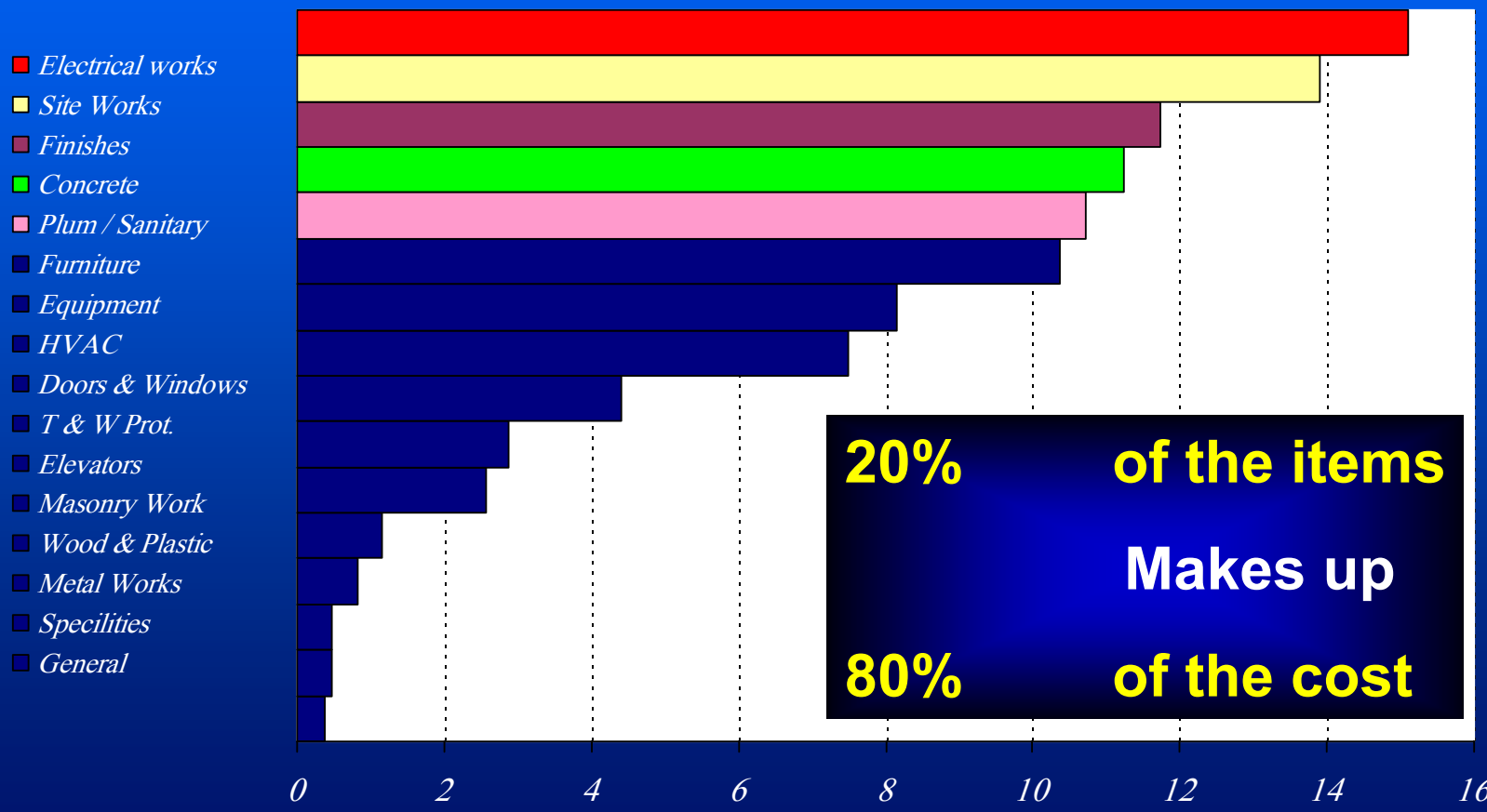
Pareto's Law the 80/20 rule

Hotel



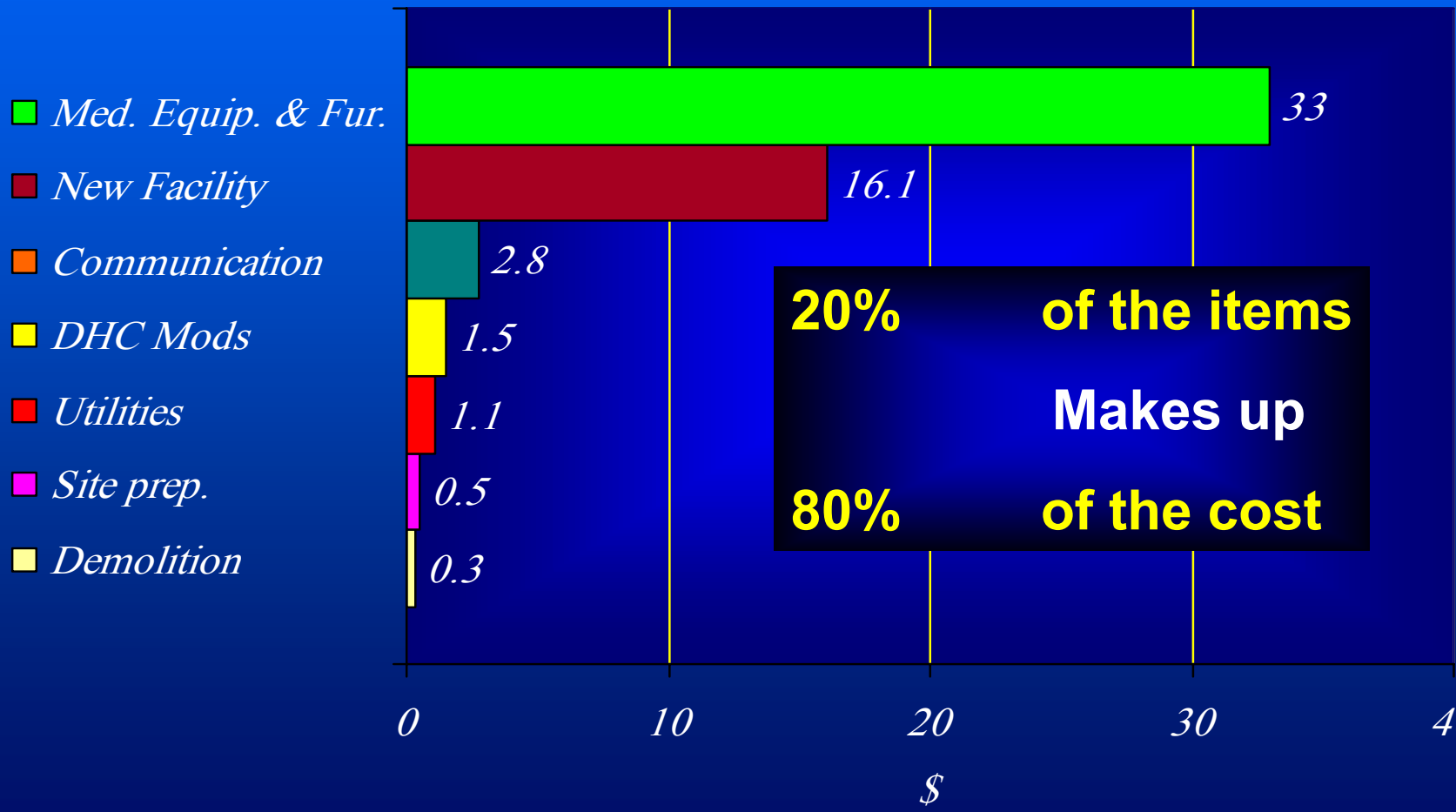
Pareto's Law the 80/20 rule

Social Center



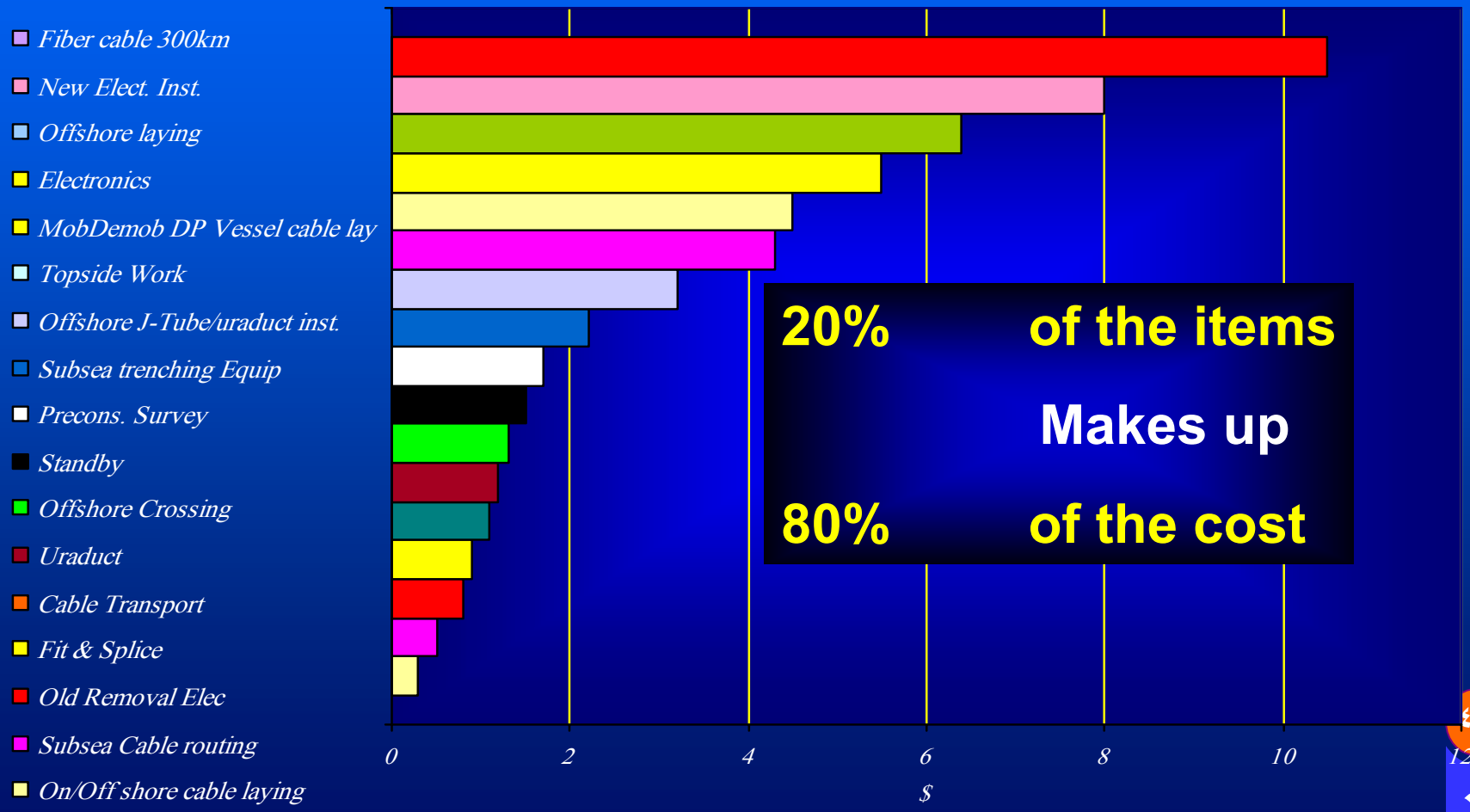
Pareto's Law the 80/20 rule

Hospital



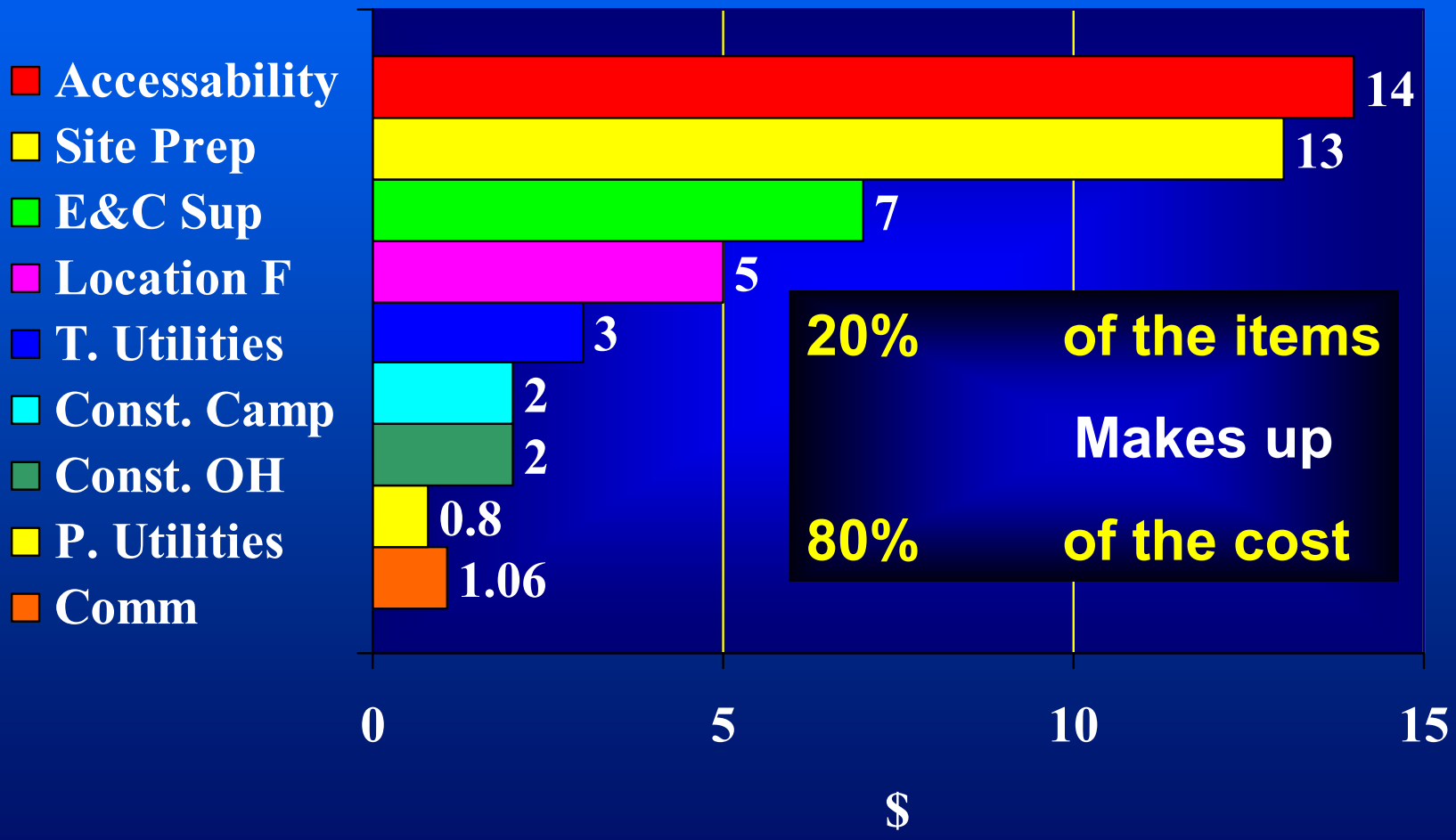
Pareto's Law the 80/20 rule

Fiber Optics



Pareto's Law the 80/20 rule

Housing

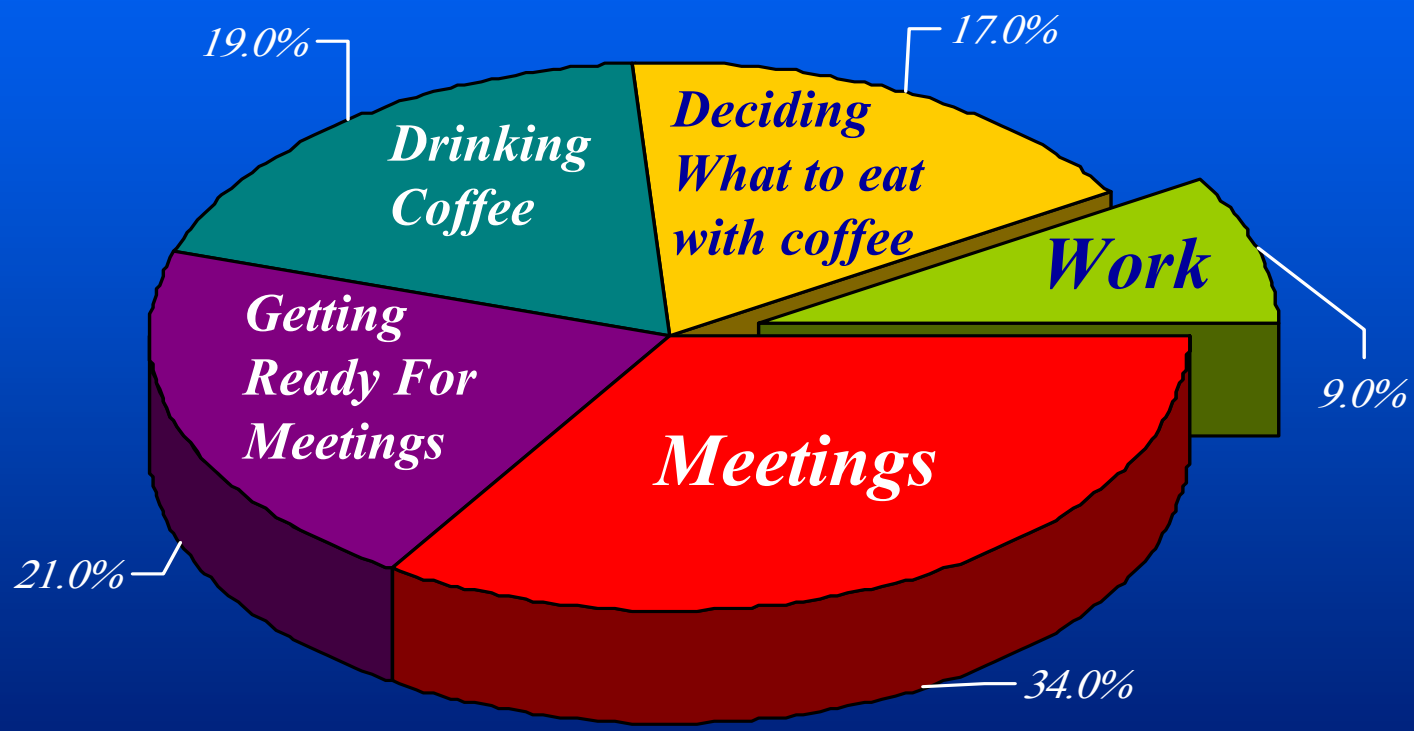


Again

Why VE

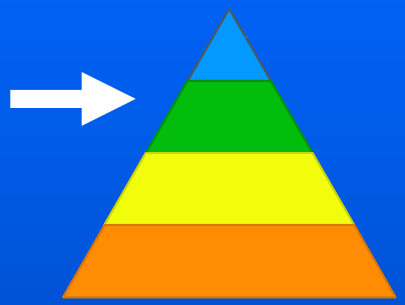
Where senior managers invest their time

How the work day is divided.

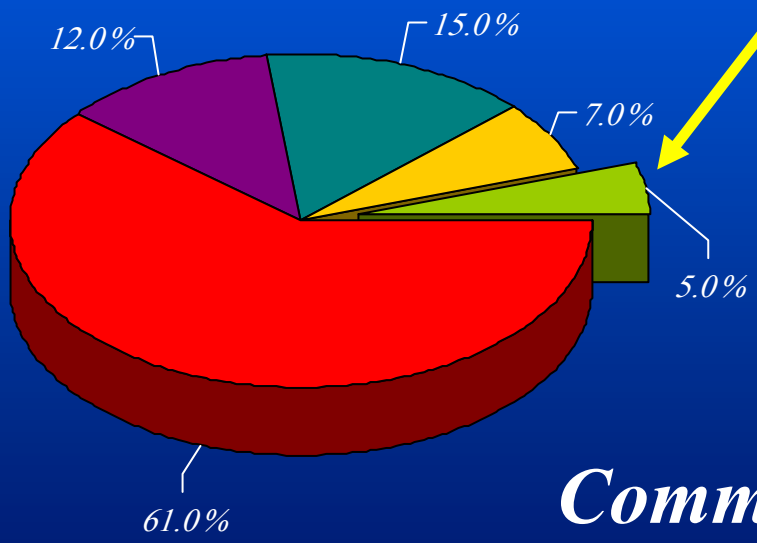


According to a survey ***(In Saudi Arabia & USA 1996)***

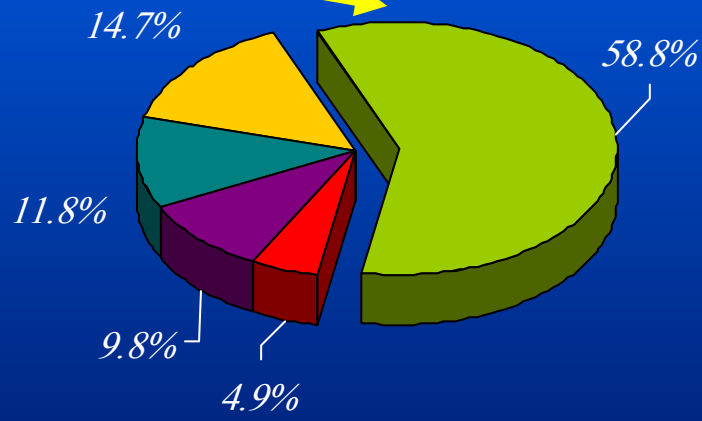
Where do senior managers invest their time …



1- Marketing
2- Human Resources
3- Projects
4- Finance
5- Quality



Actual



What they Say …

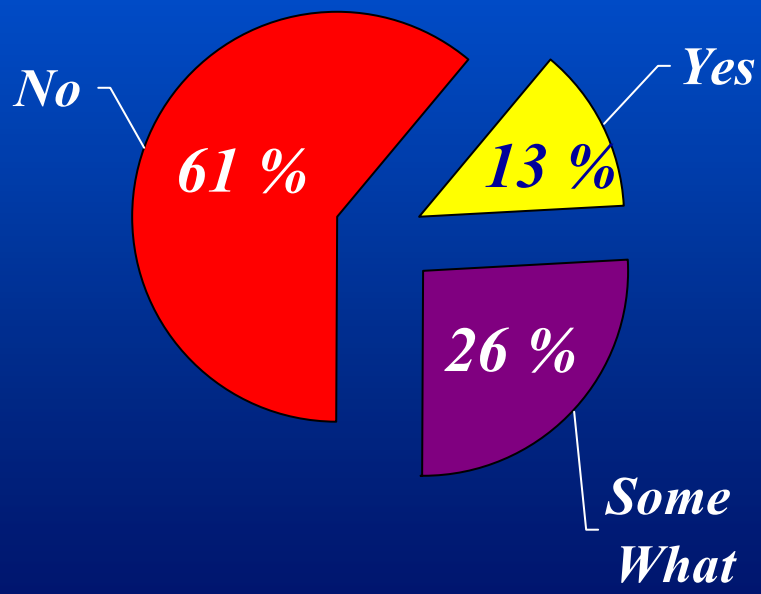
Common Sense is not always Common Practice

According to a survey (In Saudi Arabia, 1991)

When asked … after the completion of the facility:-

Q. Are you satisfied with what you've got ?

A.

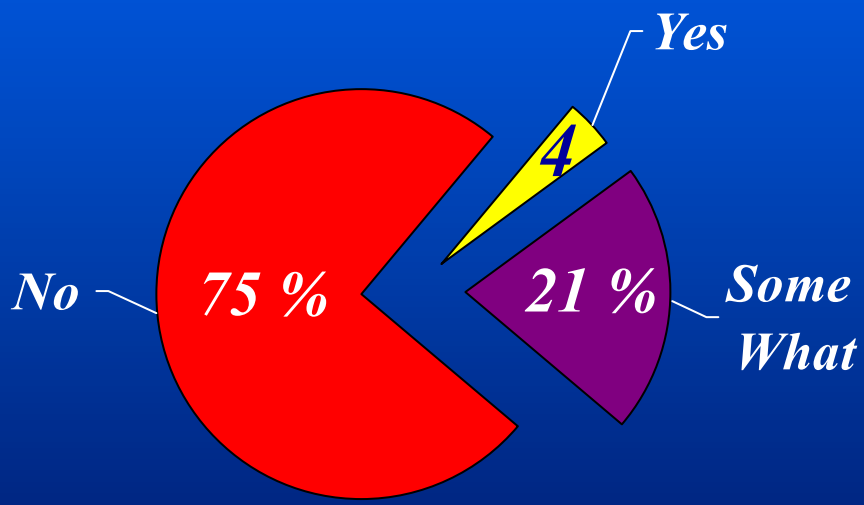


According to KSU Research , 1999

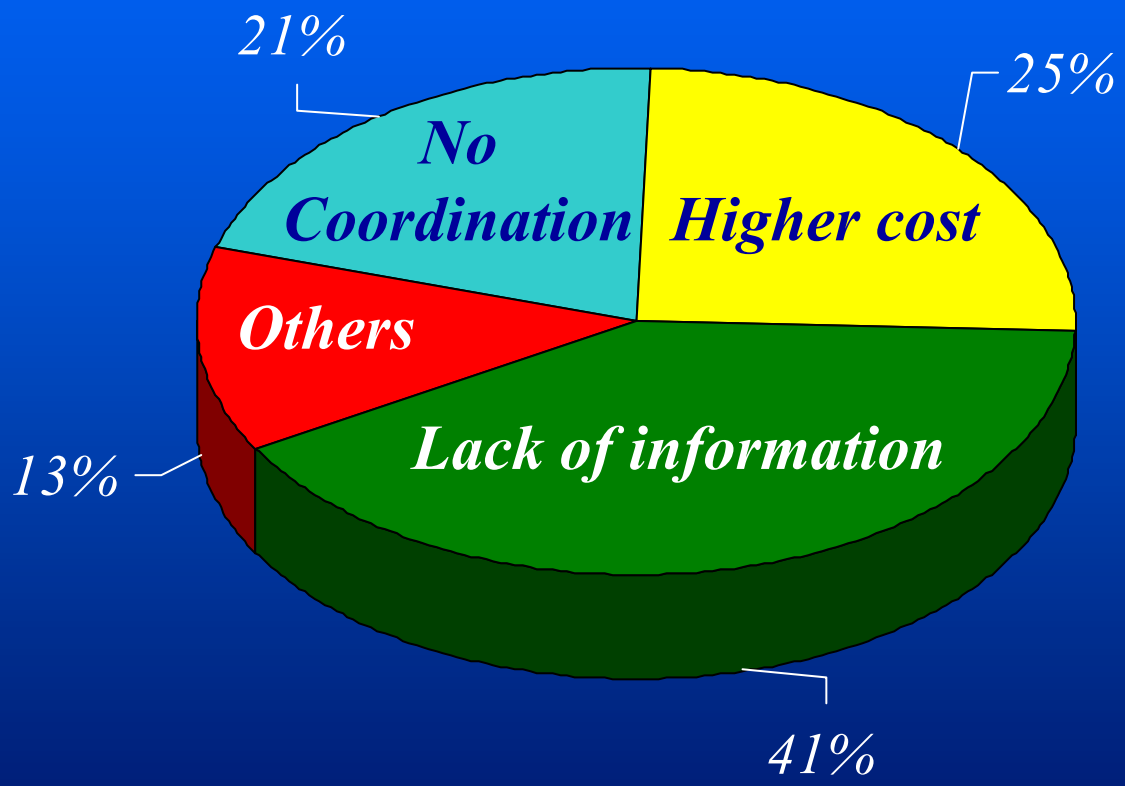
When asked … after the completion of the facility:-

Q. Are you satisfied with what you've got ?

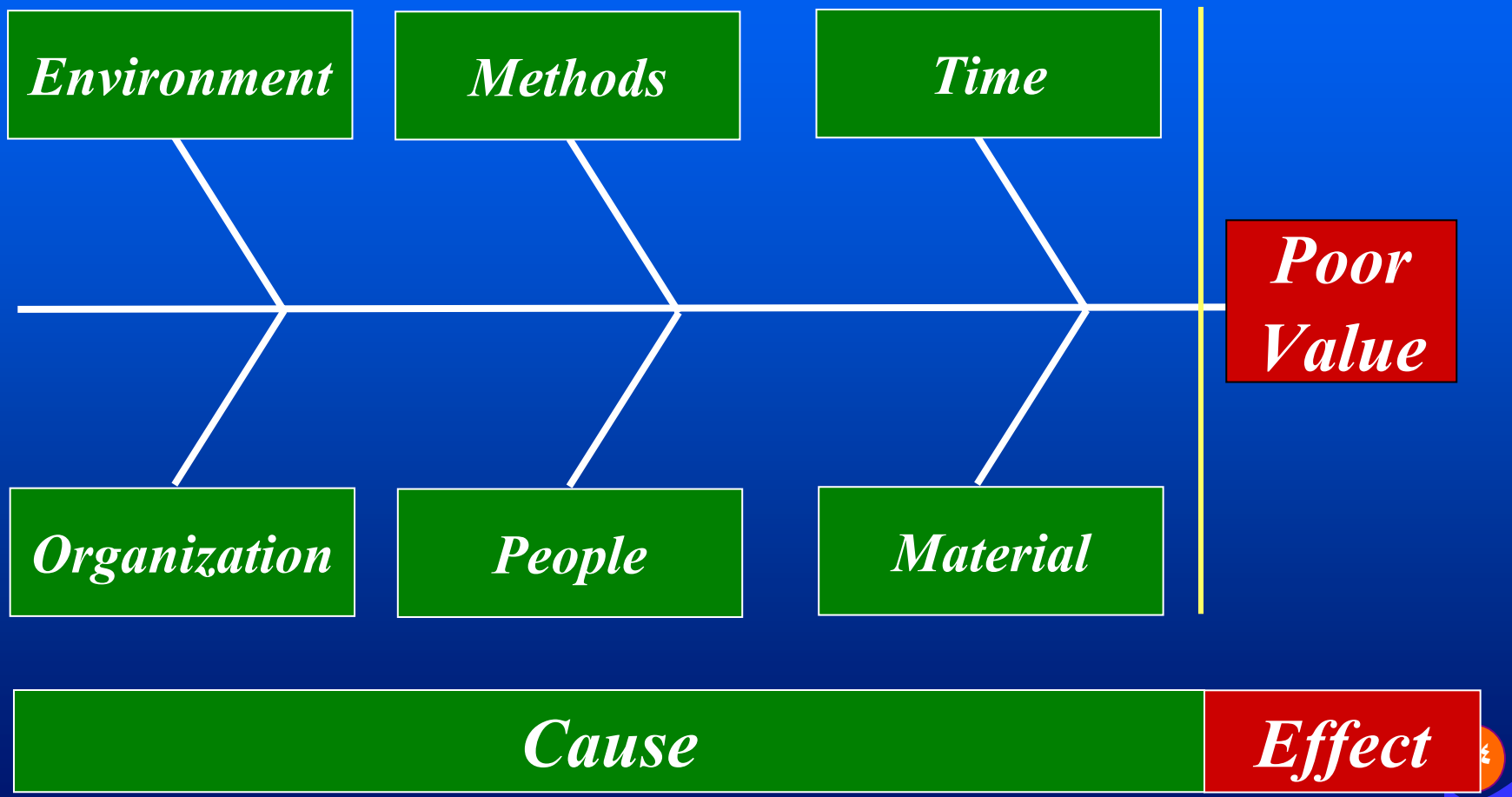
A.



Why ?

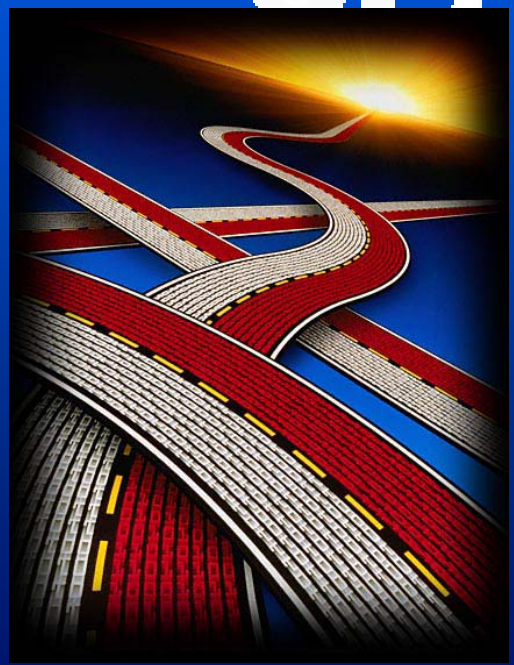

21%
25%
No Coordination
Higher cost
Others
13%
Lack of information
41%

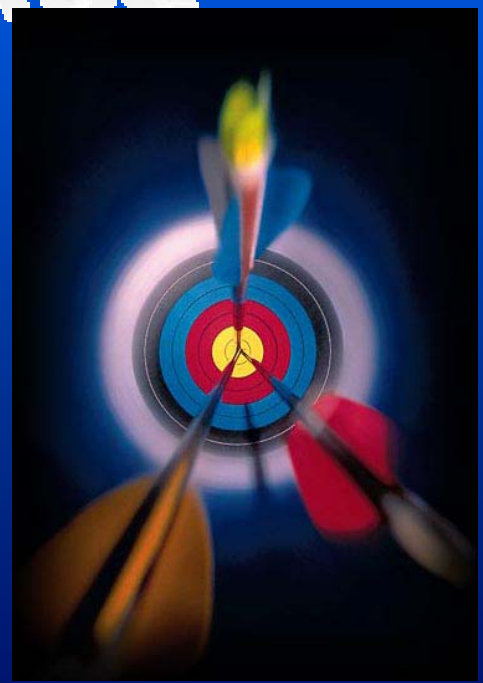
Reasons for unnecessary Costs (Poor Value)



Reasons for unnecessary Costs

Goals & Objectives





Reasons for unnecessary Costs

Goals

&

Objectives

VE Way

Reasons for unnecessary Costs (Poor Value)

- *Lack of information*
- *Lack of Ideas*
- *Lack of time*
- *Temporary circumstances*
- *Honest, but wrong beliefs*
- *Bad habits and attitudes*
- *Over design (unrealistic safety factors)*
- *Change in the owner requirements*
- *Lack of communication coordination*
- ***Using unsuitable standards & specification***
- *No LCC estimate*
- *Others*

How many projects do you know that have some of these?

Reasons for unnecessary Costs (Poor Value)

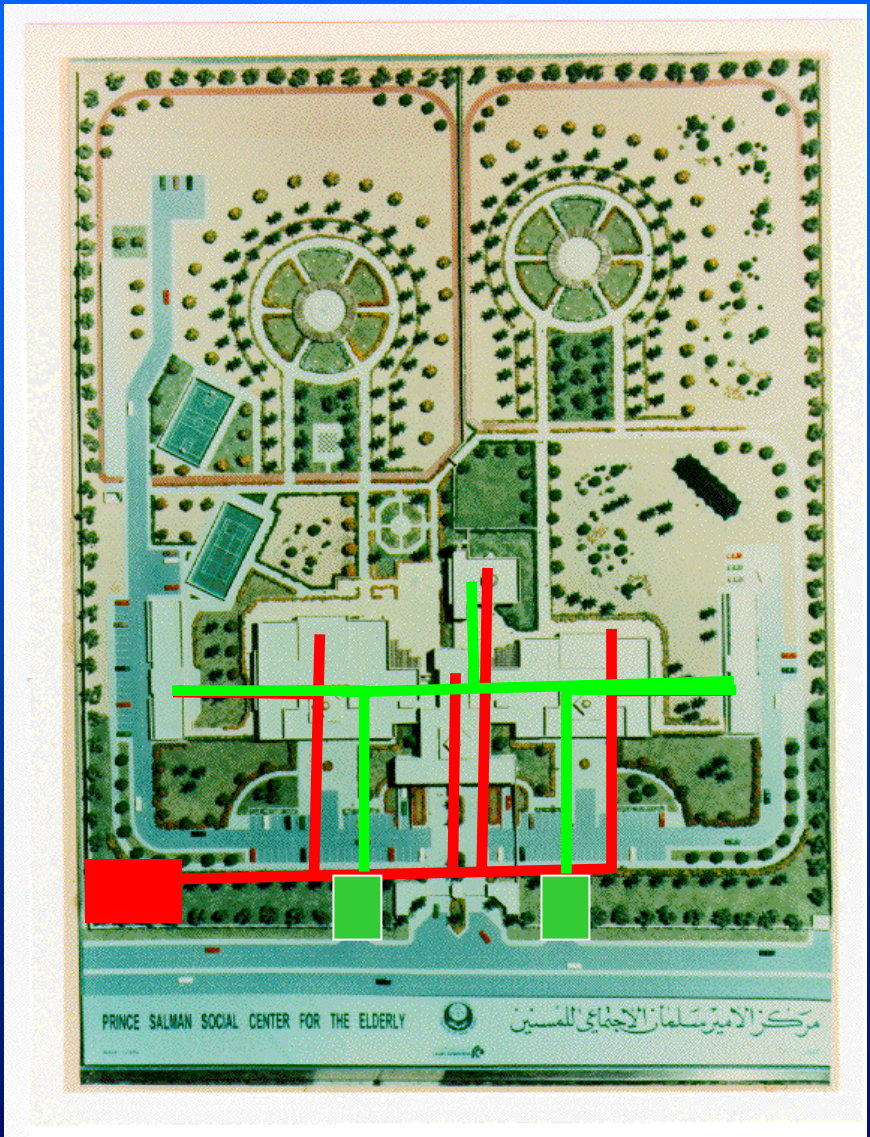
Individuals	*Organization*	*Technology*	*Environment*
Leadership	*Objectives*	*Products*	*Funding*
Habits	*Structure*	*Process*	*Timing*
Attitudes	*Planning*	*Skills*	*Politics*
Flexibility	*Communication*	*Expertise*	*Regulation*

أسباب زيادة التكاليف

هل يوجد مشروع يخلو من بعض هذه العيوب ؟

- غياب المواصفات المحلية
- قلة المعلومات (الأهداف ، المتطلبات ، التكاليف)
- المبالغة في أسس التصميم والمعايير
- المبالغة في معامل الأمان (Safety Factors)
- عدم الاستفادة من التقنيات الحديثة .
- ضعف العلاقات والتنسيق بين الجهات المعنية باتخاذ القرار
- عدم تقدير وتحديد التكلفة في البداية
- الاعتماد على الفرضيات دون الحقائق
- التركيز على التكلفة الأولية وليس التكلفة الكلية .
- ضيق الوقت المتاح للدارسات والتصميم

Honest, but wrong beliefs



Better Quality

Less cables

Less Voltage drop

Less Construction

Less Cost

$ 1.1 M Saving

Codes, Regulation, standardizations, specification

Saudi annual loss of not having standards:

- *Doors & Windows* > *one Billion*
- *Electrical Plugs* > *600 Millions*
- *Masonry Block*
- .....