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SEWP ZG622: Software Project Management (Lecture #4)

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Text Books



T1: Bob Hughes, Mike Cotterell, and Rajib Mall, Software Project Management, 5th Edition, McGraw Hill, 2011

T2: Pressman, R.S. Software Engineering : A Practitioner's Approach, 7th Edition, McGraw Hill, 2010

R1: Sommerville, I., Software Engineering, Pearson Education, 9th Ed., 2010

R2: Capers Jones., Software Engineering Best Practices, TMH ©2010

R3: Robert K. Wysocki, Effective Software Project Management, John Wiley & Sons © 2006

R4: George Stepanek, Software Project Secrets : Why Software Projects Fail, Apress ©2012

R5: A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fifth Edition by Project Management Institute Project Management Institute © 2013

R6: Jake Kouns and Daniel Minoli, Information Technology Risk Management in Enterprise Environments. John Wiley & Sons © 2010



L4: Project Evaluation –

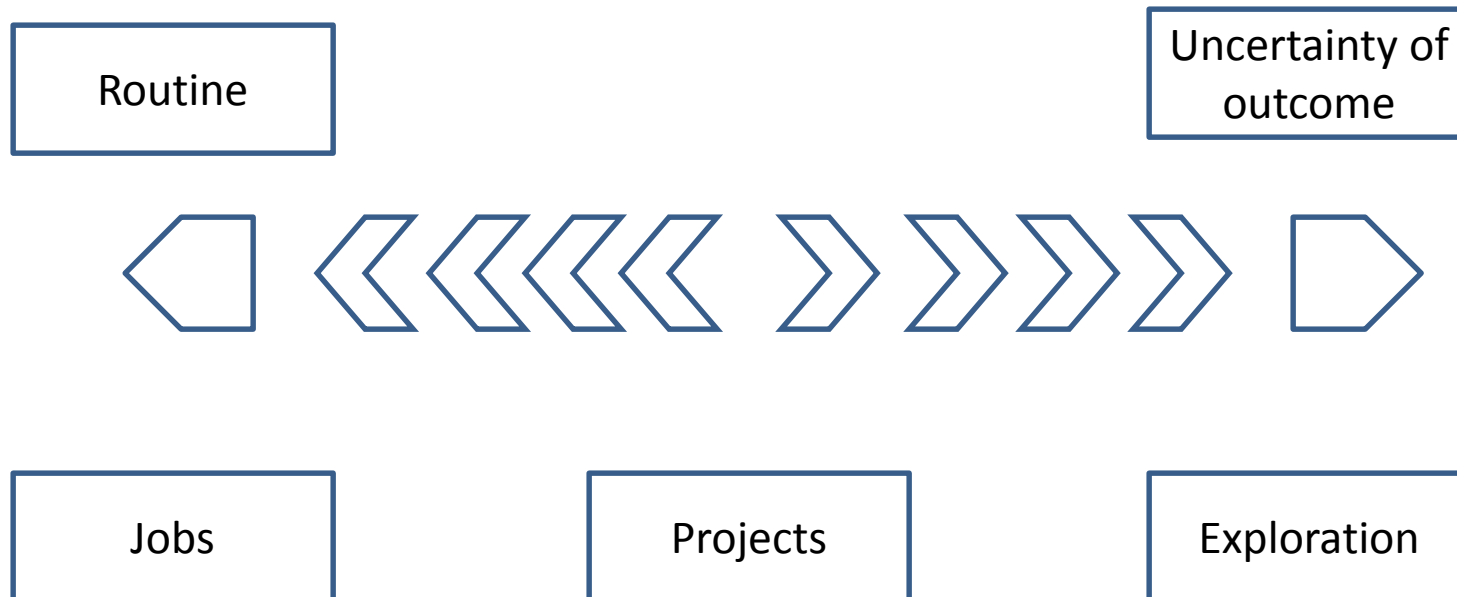
Cost Benefit Analysis, Benefits Management

Source Courtesy: Some of the contents of this PPT are sourced from materials provided by publishers of prescribed books

Project – Definition



(Review)





Software versus Other Projects

(Review)

As per Fred Brooks (Mythical Man-month fame), major distinguishing characteristics are

- Invisibility
- Complexity
- Conformity
- Flexibility



Software Project Activities (Review)

Framework Activities

Communication

Involves communication among the customer and other stake holders; encompasses requirements gathering

Planning

Establishes a plan for software engineering work; addresses technical tasks, resources, work products, and work schedule

Modeling (Analyze, Design)

Encompasses the creation of models to better understand the requirements and the design

Construction (Code, Test)

Combines code generation and testing to uncover errors

Deployment

Involves delivery of software to the customer for evaluation and feedback

Umbrella Activities

Software project tracking and control *

Assess progress against the plan

Software quality assurance

Activities required to ensure quality

Software configuration management

Manage effects of change

Technical Reviews

Uncover errors before going to next activity

Formal technical reviews

Assess work products to uncover errors

Risk management *

Assess risks that may affect quality

Measurement

process, project, product #

Reusability management (component reuse)

Work product preparation and production

Models, documents, logs, forms, lists...

etc.

Management Activities (Review)

- **Planning** – deciding what is to be done
- Organizing – making arrangements
- Staffing – selecting the right people for the job
- Directing – giving instructions
- **Monitoring** – checking on progress
- **Controlling** – taking action to remedy hold-ups
- Innovating – coming up with solutions when problems emerge
- Representing – liaising with clients, users, developers and other stakeholders

Project Objectives

(Review)

A Business-focused Definition of a Project by Robert Wysocki

- *A project is a sequence of finite dependent activities whose successful completion results in the delivery of the **expected business value** that validated doing the project.*

Setting objectives

- Answering the question '*What do we have to do to have a success?*'
- Need for a *project authority*
 - Sets the project scope
 - Allocates/approves costs
- Could be one person - or a group
 - Project Board
 - Project Management Board
 - Steering committee

Objectives



Informally, the objective of a project can be defined by completing the statement:

***The project will be regarded as a success
if.....***

Rather like *post-conditions* for the project, e.g. deliver

- agreed functionality
- to the required level of quality
- on time
- within budget

Focus on *what* will be put in place, rather than *how* activities will be carried out

Objectives should be SMART



- S** – specific, that is, concrete and well-defined
- M** – measurable, that is, satisfaction of the objective can be objectively judged
- A** – achievable, that is, it is within the power of the individual or group concerned to meet the target
- R** – relevant, the objective must be relevant to the true purpose of the project
- T** – time constrained: there is a defined point in time by which the objective should be achieved

Goals/sub-objectives

These are steps along the way to achieving the objective. Informally, these can be defined by completing the sentence...

Objective X will be achieved
IF the following goals are all achieved
A.....
B.....
C..... etc

Goals/sub-objectives continued

Often a goal can be allocated to an individual.

Individual may have the capability of achieving goal, but not the objective on their own e.g.

Objective – user satisfaction with software product

Analyst goal – accurate requirements

Developer goal – software that is reliable

Measures of effectiveness

How do we know that the goal or objective has been achieved?

By a practical test, that can be objectively assessed.

e.g. for user satisfaction with software product:

- Repeat business – they buy further products from us
- Number of complaints – if low etc etc

Program management

- PMI Definition of Program :
‘A group of related projects, subprograms, and program activities that are managed in a coordinated way to obtain benefits not available from managing them individually’
- Fern’s definition of Program Management:
‘A group of projects that are managed in a co-ordinated way to gain benefits that would not be possible were the projects to be managed independently’

Origination of Programs

Organizations address the need for change (to its products and services) by creating strategic business initiatives delivered by projects, programs, and portfolios.

Portfolios, programs, and projects should be

- Aligned with organizational strategy and objectives,

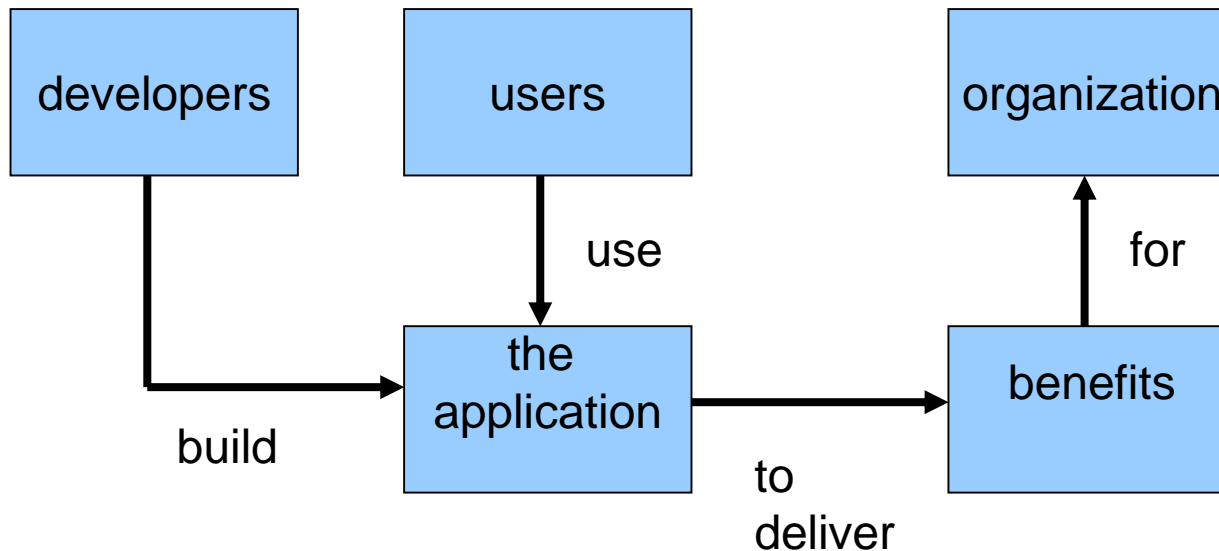
- Aligned with organizational strategy and objectives,

- Make the best use of available resources.

Programs may be

- Strategic
- Business cycle programs
- Infrastructure programs
- Research and development programs
- Innovative partnerships

Benefits management



- Providing an organization with a capability does not guarantee that this will provide benefits envisaged – need for *benefits management*
- This has to be outside the project – project will have been completed
- Therefore done at *programme level*

Benefits management

- Define expected benefits
- Analyse balance between costs and benefits
- Plan how benefits will be achieved
- Allocate responsibilities for their achievement
- Monitor achievement of benefits

Benefits

These might include:

- Mandatory requirement
- Improved quality of service
- Increased productivity
- More motivated workforce
- Internal management benefits

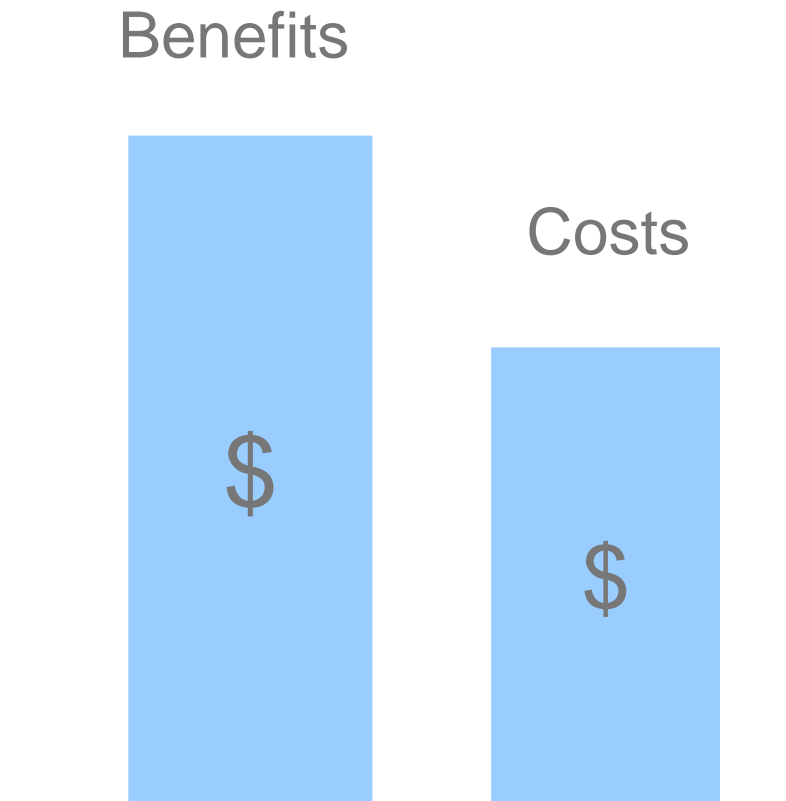
Benefits - continued

- Risk reduction
- Economies
- Revenue enhancement/acceleration
- Strategic fit

The business case

- Provides a justification for starting the project
- Should show that the benefits of the project will exceed development, implementation and operational costs
- Needs to take account of business risks
- **Feasibility studies** can also act as a 'business case'

The business case



Benefits of delivered project must outweigh costs

Costs include:

- Development
- Operation

Benefits

- Quantifiable
- Non-quantifiable

Contents of a business case

1. Introduction/ background
2. The proposed project
3. The market
4. Organizational and operational infrastructure
5. The benefits
6. Outline implementation plan
7. Costs
8. The financial case
9. Risks
10. Management plan

Content of the business case

- **Introduction/background:** describes a problem to be solved or an opportunity to be exploited
- **The proposed project:** a brief outline of the project scope
- **The market:** the project could be to develop a new product (e.g. a new computer game). The likely demand for the product would need to be assessed.

Content of the business case - continued

- **Organizational and operational infrastructure:** How the organization would need to change. This would be important where a new information system application was being introduced.
- **Benefits** These should be express in financial terms where possible. In the end it is up to the client to assess these – as they are going to pay for the project.



Content of the business case - continued

- **Outline implementation plan:** how the project is going to be implemented. This should consider the disruption to an organization that a project might cause.
- **Costs:** the implementation plan will supply information to establish these
- **Financial analysis:** combines costs and benefit data to establish value of project

Portfolio management

The concerns of project portfolio management include:

- Evaluating proposals for projects
- Assessing the risk involved with projects
- Deciding how to share resources between projects
- Taking account of dependencies between projects
- Removing duplication between projects
- Checking for gaps

Portfolio management - continued

There are three elements to PPM:

1. Portfolio definition

- Create a central record of all projects within an organization
- Must decide whether to have ALL projects in the repository or, say, only ICT projects
- Note difference between new product development (NPD) projects and renewal projects e.g. for process improvement

2. Portfolio management

- Actual costing and performance of projects can be recorded and assessed

3. Portfolio optimization

- Achieve better balance of projects e.g. some that are risky but potentially very valuable balanced by less risky but less valuable projects

You may want to allow some work to be done outside the portfolio e.g. quick fixes

COBIT5 for Risk Reduction

Problems with IT in Enterprise

- High complexity of IT environments
- Communication gap between business and IT managers
- Disappointing IT service levels from internal IT functions and also from outsourced IT providers
- IT costs are perceived to be out of control
- Unsatisfactory ROI/productivity gains on technology investments
- Impaired organizational flexibility and nimbleness to change
- Frequent resort to *ad hoc* solutions due to many constraints

Five Major Components of IT Governance

- IT principles – high level statements about how IT is used
 - IT architecture – set of technical choices to guide the organization
 - IT infrastructure strategies – technical infrastructure needed to deliver reliable, secure and efficient services
 - Business applications – process of identifying needed applications
 - IT investment and prioritization – mechanism for making decisions about project approvals and budgets
- Weill and Ross (MIT), 2004

COBIT for IT Governance

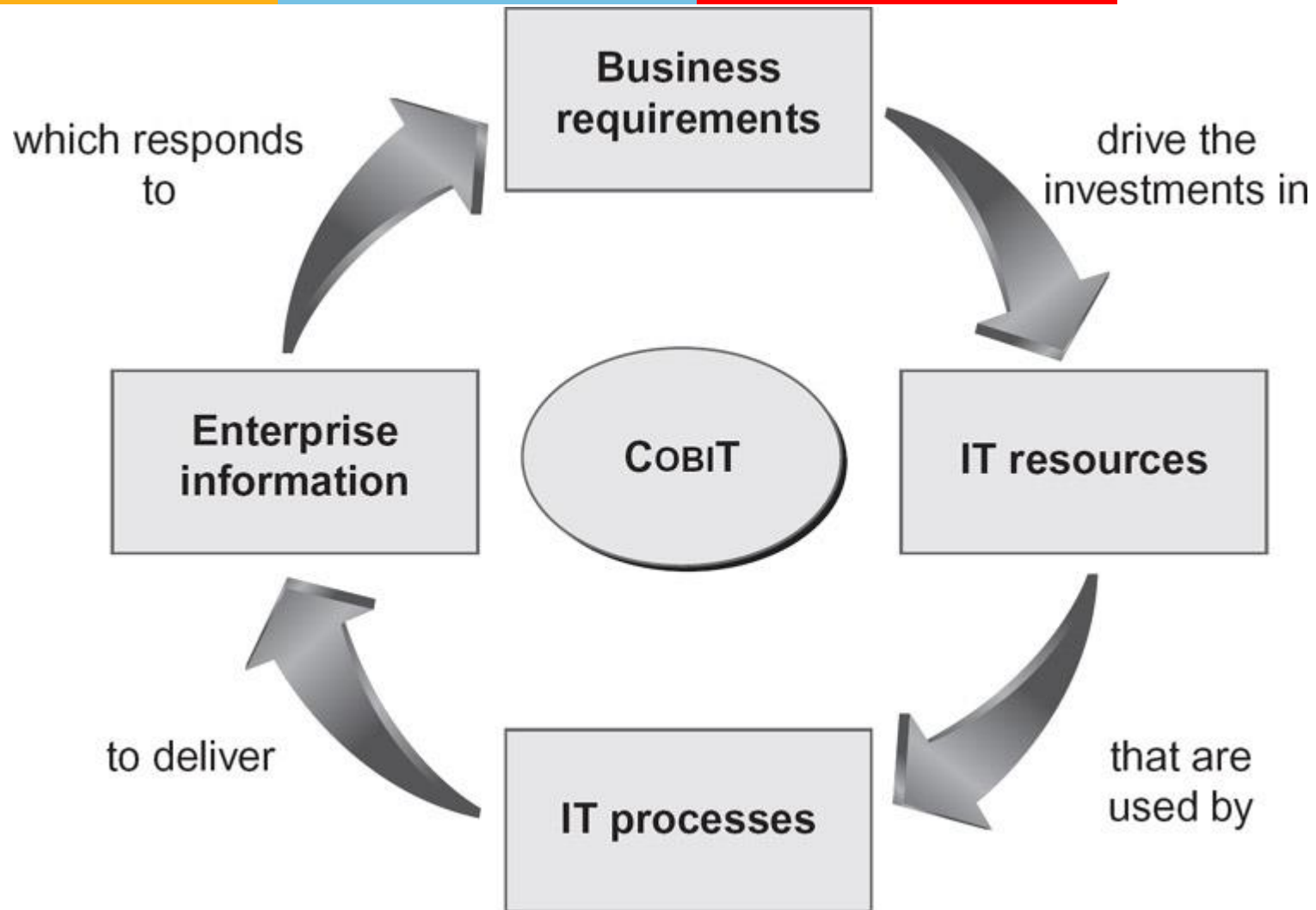
- Control Objectives for Information and Related Technology (COBIT®) provides good practices across a domain and process framework and presents activities in a manageable and logical structure. COBIT's good practices represent the consensus of experts.
- COBIT practices are focused more on control, less on execution. These practices will help optimize IT-enabled investments, ensure service delivery, and provide a measure against which to judge when things do go wrong.
- COBIT supports IT governance by providing a framework to ensure that
 - IT is aligned with the business
 - IT enables the business and maximizes benefits
 - IT resources are used responsibly
 - IT risks are managed appropriately



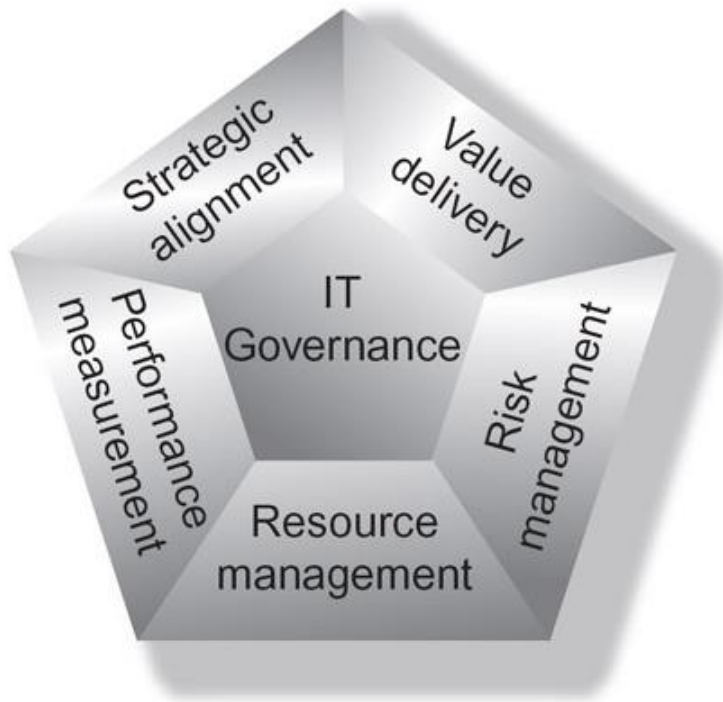
Some Pain Points addressed by COBIT 5

- Business frustration with failed initiatives, rising IT costs and a perception of low business value
- Significant incidents related to IT risk, such as data loss or project failure
- Outsourcing service delivery problems, such as consistent failure to meet agreed-on service levels
- Failure to meet regulatory or contractual requirements
- IT limiting the enterprise's innovation capabilities and business agility
- Regular audit findings about poor IT performance or reported IT quality of service problems
- Hidden and rogue IT spending
- Duplication or overlap between initiatives or wasting resources, such as premature project termination
- Insufficient IT resources, staff with inadequate skills or staff burnout/dissatisfaction
- IT-enabled changes failing to meet business needs and delivered late or over budget
- Board members, executives or senior managers who are reluctant to engage with IT, or a lack of committed and satisfied business sponsors for IT
- Complex IT operating models

Basic COBIT principle



IT governance focus areas



Strategic alignment focuses on ensuring the linkage of business and IT plans; defining, maintaining and validating the IT value proposition; and aligning IT operations with enterprise operations.

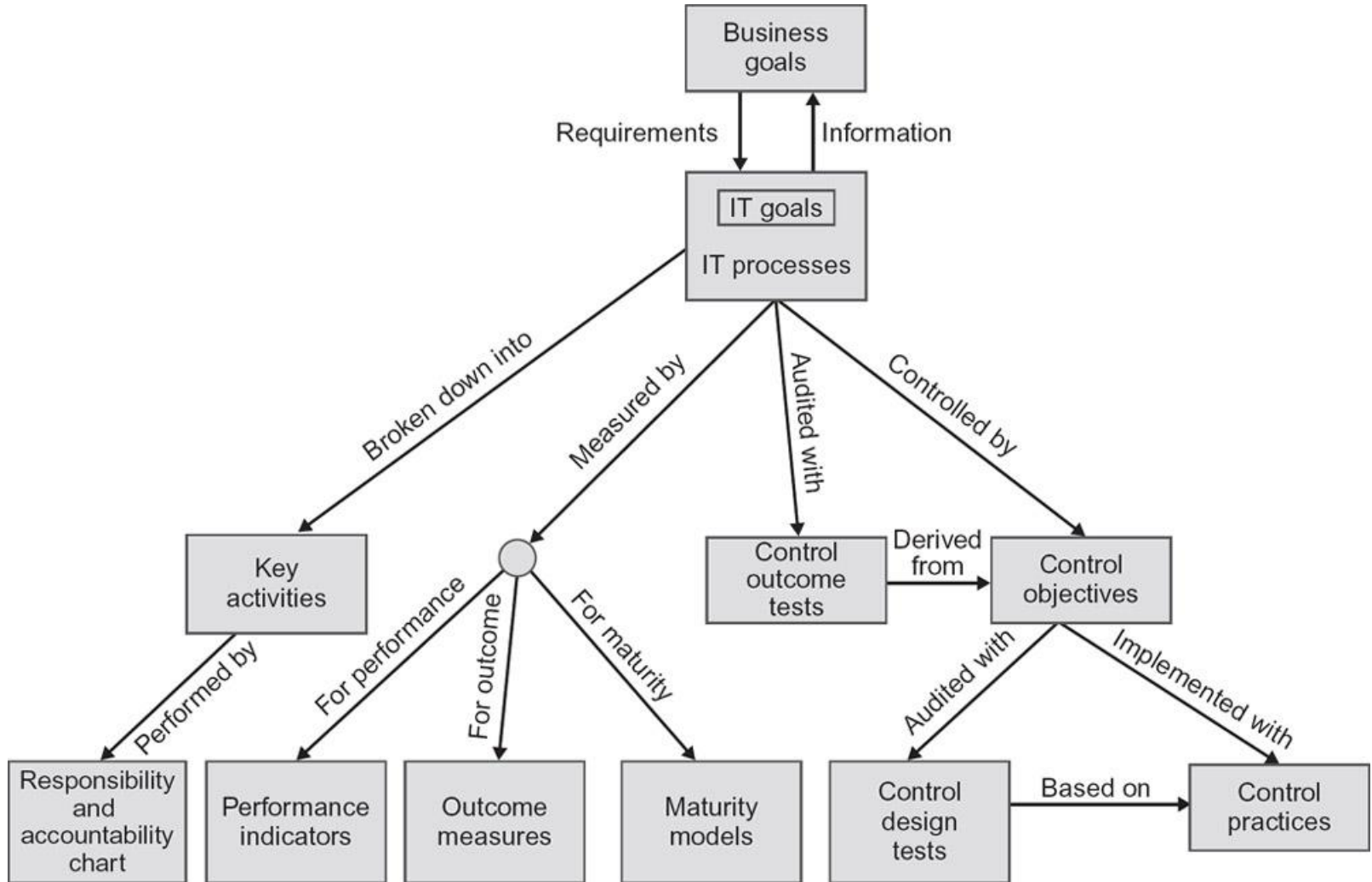
Value delivery is about executing the value proposition throughout the delivery cycle, ensuring that IT delivers the promised benefits against the strategy, concentrating on optimizing costs and proving the intrinsic value of IT.

Resource management is about the optimal investment in, and the proper management of, critical IT resources: ***applications, information, infrastructure and people***. Key issues relate to the optimization of knowledge and infrastructure.

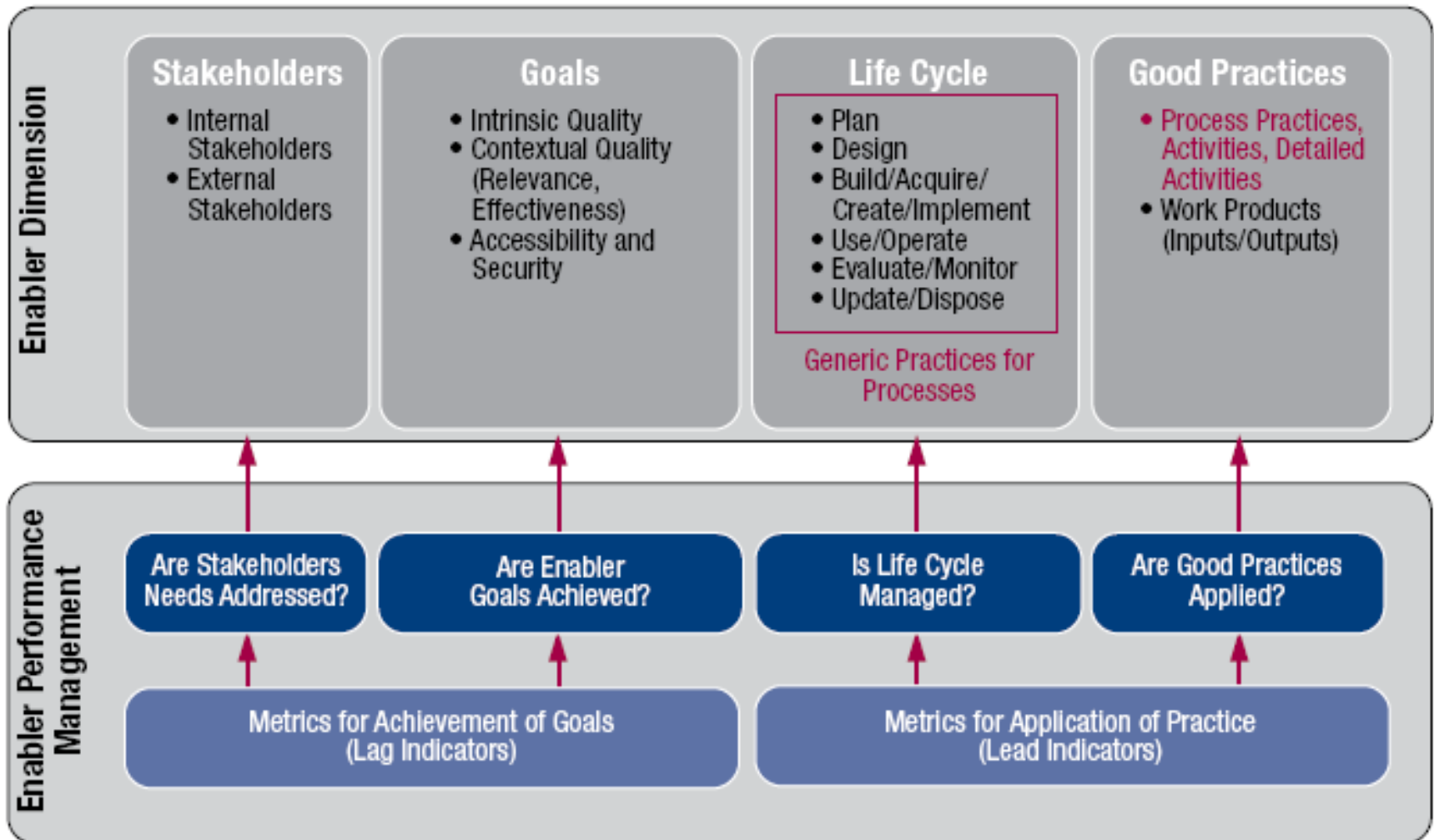
Risk management requires risk awareness by senior corporate officers, a clear understanding of the enterprise's appetite for risk, understanding of compliance requirements, transparency about the significant risks to the enterprise and embedding of risk management responsibilities into the organization.

Performance measurement tracks and monitors strategy implementation, project completion, resource usage, process performance and service delivery using, for example, balanced scorecards that translate strategy into action to achieve goals measurable beyond conventional accounting.

Interrelationships of COBIT components



COBIT 5: Enabling Processes (cont.)



Quantitative Techniques

Quantifying benefits

Benefits can be:

- Quantified and valued e.g. a reduction of x staff saving \$ y
- Quantified but not valued e.g. a decrease in customer complaints by $x\%$
- Identified but not easily quantified – e.g. public approval for a organization in the locality where it is based

Cost benefit analysis (CBA)

We need to:

- Identify all the costs which could be:
 - Development costs
 - Set-up
 - Operational costs
- Identify the value of benefits
- Check benefits are greater than costs

Project Success and Failure

- A project may meet its objectives, but may not meet business case.
 - A product delivered on time within budget, but not sell
- Project manager can control development cost, but business benefits depend on external factors
- Incidental impacts
 - Technical learning
 - Customer relationship

Net profit

Year	Cash-flow
0	-100,000
1	10,000
2	10,000
3	10,000
4	20,000
5	100,000
Net profit	50,000

‘Year 0’ represents all the costs before system is operation

‘Cash-flow’ is value of income less outgoing

Net profit value of all the cash-flows for the lifetime of the application

Pay back period

This is the time it takes to start generating a surplus of income over outgoings. What would it be below?

Year	Cash-flow	Accumulated
0	-100,000	-100,000
1	10,000	-90,000
2	10,000	-80,000
3	10,000	-70,000
4	20,000	-50,000
5	100,000	50,000

Return on investment (ROI)

$$\text{ROI} = \frac{\text{Average annual profit}}{\text{Total investment}} \times 100$$

In the previous example

- average annual profit
= 50,000/5
= 10,000
- ROI = 10,000/100,000 X 100
= 10%

Net present value

Would anyone prefer to receive \$100 today or in 12 months time?

If one gave you \$100 now you *could* put it in savings account and get interest on it.

If the interest rate was 10% how much would I have to invest now to get \$100 in a year's time?

This figure is the *net present value* of \$100 in one year's time

Discount factor

$$\text{Discount factor} = 1/(1+r)^t$$

r is the interest rate (e.g. 10% is 0.10)

t is the number of years

In the case of 10% rate and one year

$$\text{Discount factor} = 1/(1+0.10) = 0.9091$$

In the case of 10% rate and two years

$$\text{Discount factor} = 1/(1.10 \times 1.10) = 0.8294$$

Applying discount factors

Year	Cash-flow	Discount factor	Discounted cash flow
0	-100,000	1.0000	-100,000
1	10,000	0.9091	9,091
2	10,000	0.8264	8,264
3	10,000	0.7513	7,513
4	20,000	0.6830	13,660
5	100,000	0.6209	62,090
		NPV	618

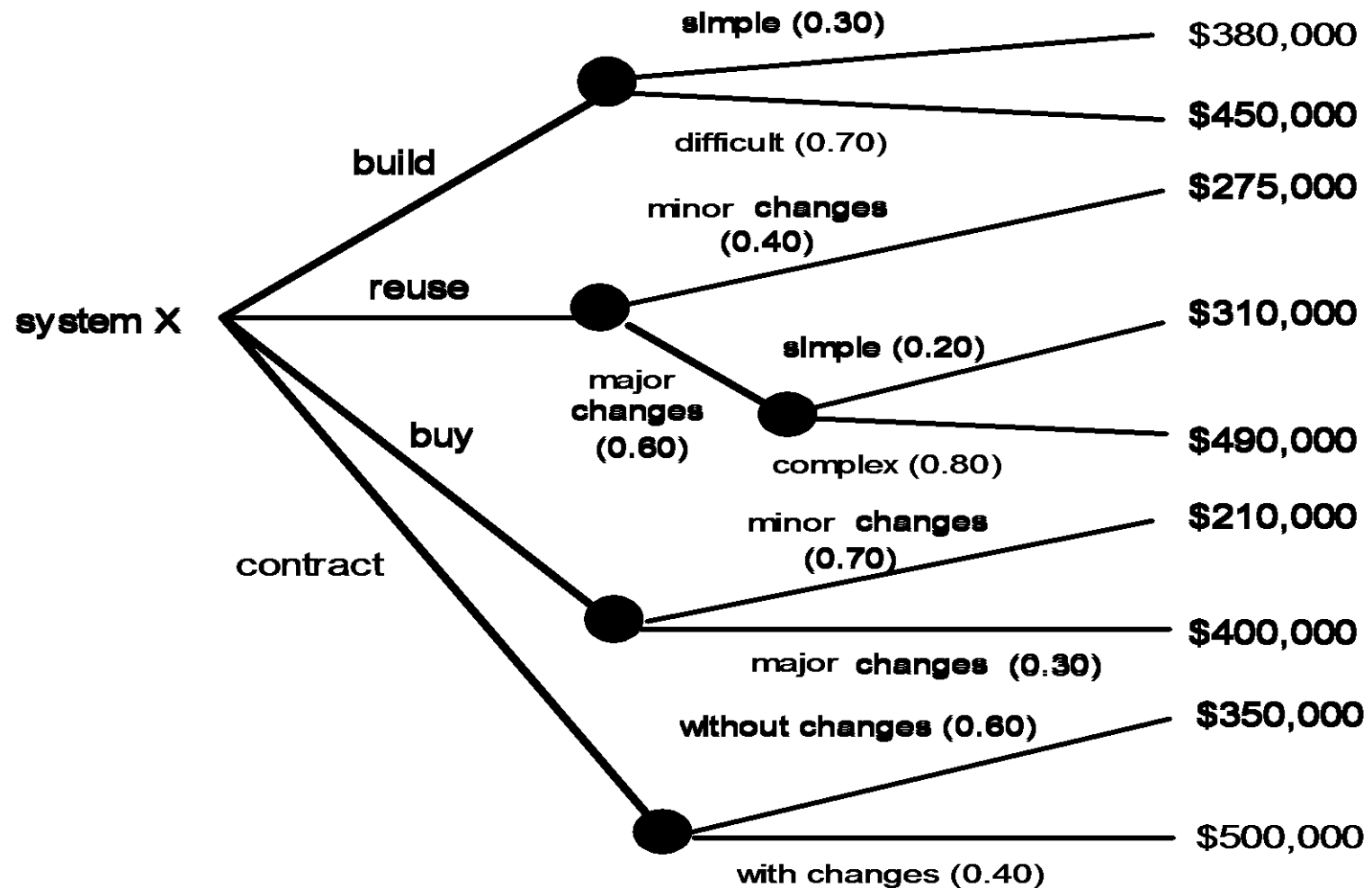
Internal rate of return

- Internal rate of return (IRR) is the discount rate that would produce an NPV of 0 for the project
- Can be used to compare different investment opportunities
- There is a Microsoft Excel function which can be used to calculate

Alternative Assessment (Make/Buy Decision)

- It is often more cost effective to acquire rather than develop software
- Managers have many acquisition options
 - Software may be purchased (or licensed) off the shelf
 - “Full-experience” or “partial-experience” software components may be acquired and integrated to meet specific needs
 - Software may be custom built by an outside contractor to meet the purchaser’s specifications
- The make/buy decision can be made based on the following conditions
 - Will the software product be available sooner than internally developed software?
 - Will the cost of acquisition plus the cost of customization be less than the cost of developing the software internally?
 - Will the cost of outside support (e.g., a maintenance contract) be less than the cost of internal support?

Decision Tree



Computing Expected Cost

expected cost =

$$\sum (\text{path probability}) \times (\text{estimated path cost})$$

For example, the expected cost to build is:

$$\begin{aligned} \text{expected cost}_{\text{build}} &= 0.30 (\$380\text{K}) + 0.70 (\$450\text{K}) \\ &= \$429 \text{ K} \end{aligned}$$

similarly,

$$\text{expected cost}_{\text{reuse}} = \$382\text{K}$$

$$\text{expected cost}_{\text{buy}} = \$267\text{K}$$

$$\text{expected cost}_{\text{contr}} = \$410\text{K}$$

Project Selection

- Organizations tend to invest in a project that, in and of itself is not profitable or beneficial, but offers great promise, such as:
 - Learning about a new technology
 - Gaining access to potential new customers
 - Obtaining the right to bid on a lucrative follow-on contract
 - Improving the firm's competitive strength
 - Offer profitable maintenance, repair, or service on project work

Software pricing

- Estimates are made to discover the cost, to the developer, of producing a software system.
 - You take into account, hardware, software, travel, training and effort costs.
- There is not a simple relationship between the development cost and the price charged to the customer.
- Broader organisational, economic, political and business considerations influence the price charged.

Factors affecting software pricing

Factor	Description
Market opportunity	A development organization may quote a low price because it wishes to move into a new segment of the software market. Accepting a low profit on one project may give the organization the opportunity to make a greater profit later. The experience gained may also help it develop new products.
Cost estimate uncertainty	If an organization is unsure of its cost estimate, it may increase its price by a contingency over and above its normal profit.
Contractual terms	A customer may be willing to allow the developer to retain ownership of the source code and reuse it in other projects. The price charged may then be less than if the software source code is handed over to the customer.
Requirements volatility	If the requirements are likely to change, an organization may lower its price to win a contract. After the contract is awarded, high prices can be charged for changes to the requirements.
Financial health	Developers in financial difficulty may lower their price to gain a contract. It is better to make a smaller than normal profit or break even than to go out of business. Cash flow is more important than profit in difficult economic times.

Thank You

Any Questions?