

**Accounting
Information Systems
ACC/ACF 2400**

Semester 1, 2018

Comprehensive Notes

Unit Schedule

AIS Systems and Transaction Processing	Topic 1
Enterprise Resource Planning Systems	Topic 2
Ethics in AIS, fraud & cybercrime	Topic 3
Control & accounting information systems	Topic 4
Controls for information security & confidentiality	Topic 5
System documentation techniques	Topic 6
Revenue Cycle	Topic 7
Expenditure Cycle	Topic 8
Production Cycle	Topic 9
Introduction to Systems Development, Systems Analysis and AIS Development Strategies	Topic 10
Systems Design, Implementation and Operation	Topic 11

Accounting Information Systems & Transaction Processing

A firm – Enterprise with 2 or more employees (owner / employer + at least one other person)

Characteristics of employer – employee relationship:

- **Employee** has a duty to render personal services to the employer or to others on behalf of the employer. Employee is different to an independent contractor because payment is not tied to a specific task or output.
- **Employer** has right to control employee's work, either personally or by another employee and also can tell employee when and what work to do.

The Nexus of Contracts:

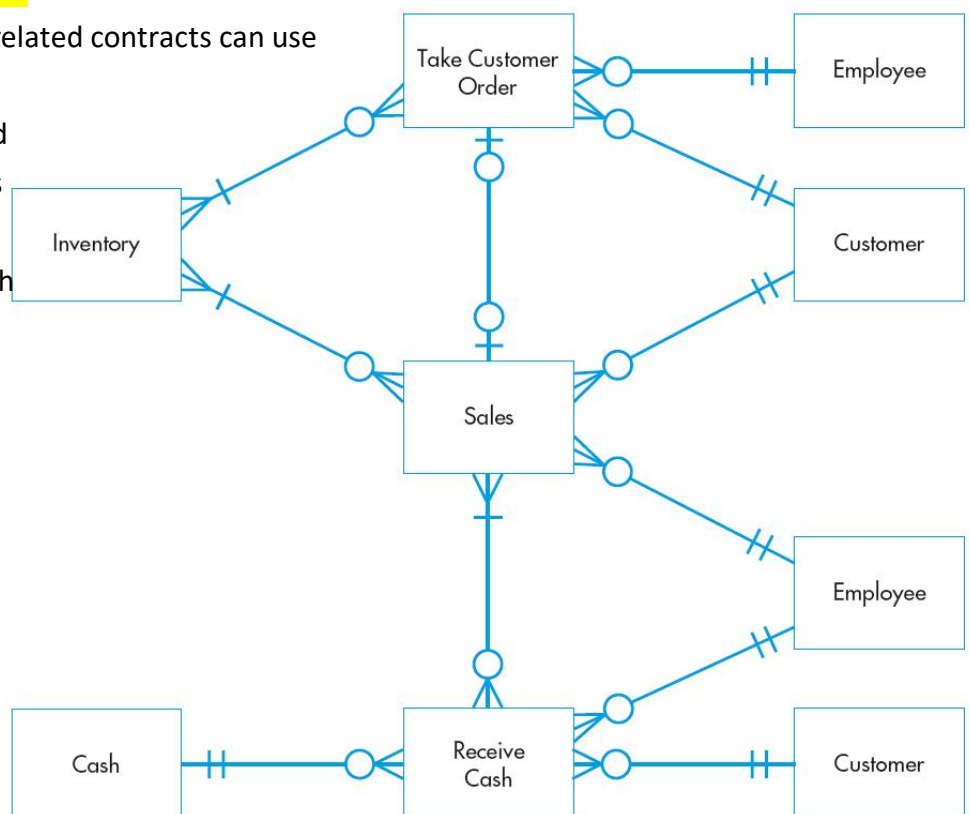
Demonstrates that the firm is a legal fiction defined by a web of interrelated and relatively simple contracts between itself and suppliers, workers, investors, managers, customers.

Documenting the Nexus of Contracts:

To document typical transaction – related contracts can use

REA models, which shows:

- What resources are involved
- When the contract operates (i.e. type of event)
- Who we are contracting with



Why do firms exist?

Efficiency and profitability

Having a servant (employee) is more efficient, and less costly than finding and hiring a contractor for every activity to employer can't perform.

But there are limits:

- As a firm grows, cost of organizing staff and allocating resources to activities increases

- Have to hire people to oversee and coordinate activities (normally role of employer)
- Have to ensure that there are enough people that duties do conflict (e.g. can't have people approving their own purchases or salary bonuses)
- The larger the firm, the more coordination required

It is possible for a firm to grow too large to be managed effectively

Business Transactions

Business system

- Protects organizational assets
- Provides information to owners and managers about state of business
- Provides a structured way to process transactions

Transaction

- An agreement between two entities to exchange goods or services that can be measured in economic terms.
- We document how transactions are processed using diagrams such as REA and flowcharts
- In accounting we record it as a 'Give-get' exchanges between two entities (e.g. I give money, you give a product/service)
- Transactions can also be internal
 - Still a measurable exchange
 - But the exchange has no impact on firm value

Types of Transaction

Each transaction is part of one of the major business cycles

- Revenue
- Expenditure
- Production
- Human resources/Payroll
- General ledger and reporting

What is a system?

System

- A set of two or more interrelated components interacting to achieve a goal

Goal conflict

- Occurs when components act in their own interest without regard for the overall goal

Goal congruence

- Occurs when components acting in their own interest contribute towards the overall goal

AIS and Corporate Strategy - LEARN

Organisations have limited resources.

Use models (often constructed in Excel) to assess whether investment proposal is TELOS

T - Technically feasible

E - Economically feasible (have a positive ROI, affordable cash flow timing)

L - Legally feasible

O - Operationally feasible (fits in with existing business environment and objectives)

S - Schedule feasibility

When assessing changes to the AIS, managers need to understand:

- IT developments
- Business strategy
- Organisational culture
- How they will use AIS
- How changes to AIS will affect operations and strategy

Date & Information

Data = facts that are collected, recorded, stored and processed.

- Insufficient for decision-making

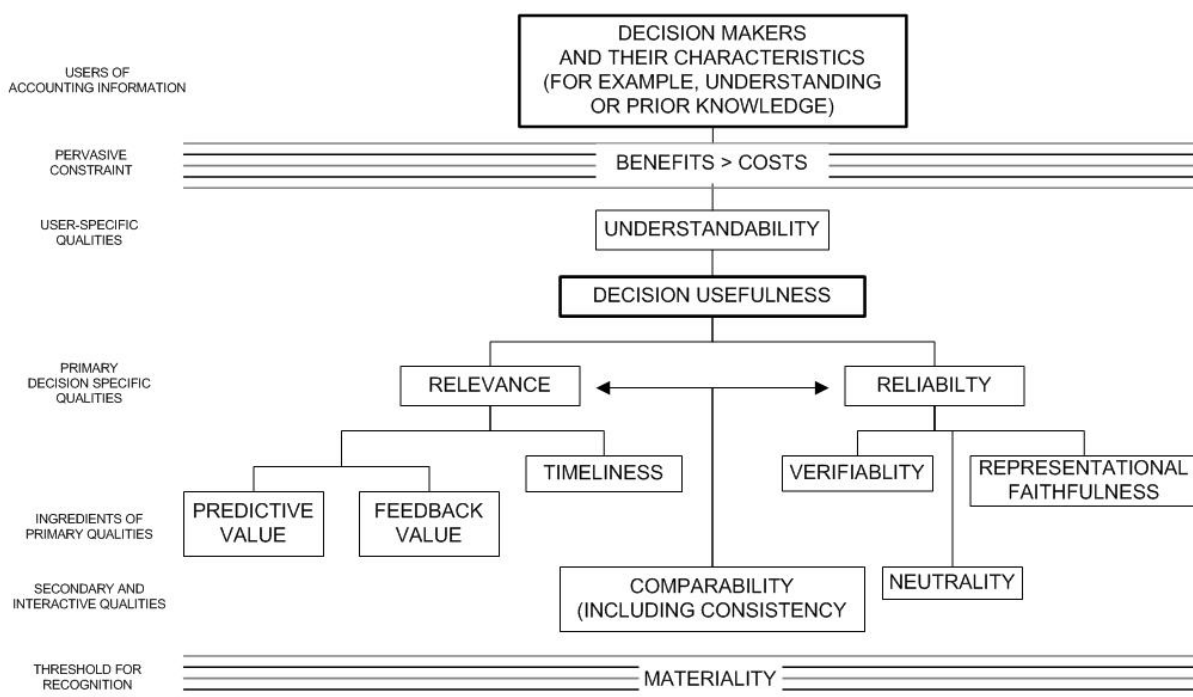
Information = processed data used in decision making.

- Too much information however, will make it more, not less, difficult to make decisions. This is known as 'data overload' or 'information overload'.

Useful information

- When deciding which information is more useful it is important to think about the accounting qualities
- See diagram below for characteristics of useful information

A HIERARCHY OF ACCOUNTING QUALITIES



Ethics

Types of Ethics

Consequentialist ethics

- Consequentialists judge actions by outcomes
 - o Right actions produce net 'good' outcomes, wrong produce net 'bad'
- Support whatever property arrangements create the best consequences among all those affected (e.g. a bribe to support an aid project is justifiable)
 - o E.g. might argue that bribery (or related behaviour) is sometimes permissible such as when it is the only way to obtain approval for an aid project

Non – consequentialist ethics

- Consequences are irrelevant
- Can't justify an action by showing that it produced good consequences
- Some acts are inherently right or wrong so people have a duty to act accordingly, regardless of consequences
- If theft is wrong attempted theft is also wrong

Kant's Categorical Imperative

- Always act in such a way that you would be willing for it to become a general law that everyone should do the same in the same function
 - o E.g. Breaking a promise should only be done if you believe that universally it is okay for people to break that promise
- Moral rules must respect human beings: act so that you treat humanity, both in your own person and in that of another, always as an end and never merely as a means
 - o Everyone has inherent dignity that should be respected
 - o People should always be treated as valuable and should not just be used in order to achieve something else (i.e. no one should trick, manipulate, bully into doing something)
- Do the right thing for the right reason, because this is the right thing to do

Applying ethical principles/rules to Stakeholder Analysis - IMPORTANT

- Is there an ethical situation or dilemma?
- Move to a resolution by identifying elements of the problem:
 - o What stakeholders may be harmed?
 - o Whose rights or claims may be violated?
 - o Which specific interests are in conflict?
 - o What are my responsibilities and obligations
- Specific alternatives and weigh up impacts of each various stakeholders
- Select best or most ethical alternatives

ETHICAL ANALYSIS EXAMPLE – ENRON CASE (WEEK 1 POWERPOINT)

David Duncan, the lead auditor of Enron Corporation, thinks Enron is understating the liabilities on its balance sheet. Enron's transactions are complex, and outsiders may never figure this out. Duncan asks his firm's Standards Committee how he should handle the situation. They reply '*Require Enron to report all its liabilities.*'

Enron is Duncan's most important client. His team and other partners provide non-audit consulting services (IT management, strategy, tax, and many other products) that are more profitable than audit. These contracts tend to be given to the auditor.

And Enron is pressuring him to certify liabilities.

Duncan can rationalise that Enron's reported amounts are OK. What should he do?

What is the ethical issue?

What action should Duncan take now that he suspects that Enron may be understating the liabilities on the balance sheet?

What are the principle elements?

-Who may be harmed?

Duncan, Duncan's firm. Investors, financiers, creditors, possibly employees if the understatement is large, the auditing profession as a whole

-Whose rights/ claims may be violated?

Investors, financiers, creditors

-What interests are in conflict?

- Enron's interest in having its accounts certified with a clean opinion is in conflict with
 - o Duncans obligations as specified auditing standards
 - o Professional code of ethics (CPA body)
 - o Investors, creditors interests in being able to rely on accounts as true and fair with regards to investment and lending decisions
- Duncan's professional obligations are in conflict
 - o As an auditor, he should investigate
 - o As a partner, Enron is an important client to his firm
- The firms interests are in conflict
 - o Standards committee wants to uphold high standards
 - o Firm sells audit and non audit services. Valuable non audit contracts are at risk

-What are your responsibilities and obligations?

- Duncan is bound by his firms rules (the standards committee has given him clear advice)
- Duncan is bound by the code of ethics of his professional organization
- Legally and morally, Duncan has a duty of care that extends beyond his relationship with Enron

-Ethical Analysis: Enron Case

What options exists and what are the consequences?

Option 1: Follow advice , force Enron to report true value of liabilities

Consequences:

Enron: Must increase reported liabilities and may be hurt if change reveals debt violations or that the firm is financially unsounds

Duncan: May lose Enron as a client and tarnish firms reputation, may lose his job and lose audit income

Option 2: Certify Enron's Liabilities as reported

Consequences:

- If no one objects and Enron remains financially viable, Duncan will keep client
- If liability actually higher than reported and Enron's financial position is problematic, stakeholders may lose money and sue Duncan's firm
- Apart from financial loss, this will damage his reputation, his firm's reputation and possibly even the reputation of the profession.

-What is the most ethical course of action?

Forcing Enron to re – state liabilities

-What did Duncan actually do?

- Went against his firm's advice, certified Enron's liabilities
- When problems were detected by financial journalist
 - o Investigators confirmed fraud
 - o Duncan had to retract his audit opinion
 - o Enron's share value plummeted
 - o Investors, lenders and creditors lost money and sued
 - o Duncan's firm, Arthur Andersen closed down
 - o Auditors rep suffered

Limitation of Stakeholder Analysis

- Assumes that a good outcome can be found by balancing interests of each stakeholder
- May not be possible
 - o Might have multiple mutually exclusive interests
 - o Weighing alternatives is necessarily subjective. How can weights be justified?
- Stakeholder analysis is not a moral process
 - o The majority of Stakeholders may be pleased with a solution that is illegal or immoral.

What is business analytics?

- A field of study that uses computers, statistics, and mathematics to solve business problems
- Also known as:
 - o Operations research
 - o Management science
 - o Decisions science

Common elements between AIS & Business Analytics (BA)

- AIS process massive amounts of transactional data (big data) on a daily basis
- Only a small fraction of this data is analysed and used in managerial/financial reports
- The data will be meaningful if its properly represented and analysed
- New fascinated methods for data analysis appeared recently (e.g. machine learning)

Areas of BA's use

- Analysing customer behaviours, buying patters and sale trends
- Measuring, tracking and predicting sales and financial performance
- Budgeting and financial planning and forecasting
- Tracking the performance of marketing campaigns
- Optimizing processes and operational performance
- Improving delivery and supply chain effectiveness
- Web and e-commerce analytics
- Customer relationship management
- Risk analysis
- Strategic value driver analysis

What is a 'Computer Model'?

- A set of mathematical relationships and logical assumptions implemented in a computer as an abstract representation of a real-world object of phenomenon
- Spreadsheets provide the most convenient way for business people to build computer models

The Modeling Approach to Decision Making

- Everyone uses models to make decisions
- Types of models:
 - o Mental (arranging furniture)
 - o Visual (blueprints, roadmaps etc.)
 - o Physical/scale (aerodynamics, buildings)
 - o Mathematical (area of study in ACC2400)

Characteristics of Models

- Models are usually simplified versions of the things they represent

- A valid model accurately represents the relevant characteristics of the object or decision being studied

Benefits of Modeling

- Economy – it is often less costly to analyze decision problems using models
- Timeliness – models often deliver needed information more quickly than their real-world counterparts
- Feasibility – models can be used to do things that would be impossible
- Models give us insight and understanding that improves decision making

Example of Mathematical Modeling

- Profit = Revenue – Expenses
- I.e. Profit = $f(\text{Revenue}, \text{Expenses})$
- I.e. $Y = f(X1, X2)$
 - Where Y is a dependent variable (aka bottom line performance measure)
 - X1, X2 etc. are independent variables (inputs having an impact on Y)
 - F(---) is a function defining the relationship between the X1, X2 etc. and Y

Design guidelines for excel

Well-designed spreadsheets are:

- Likely to meet user requirements
- Easy to understand
- Reliable (i.e. tested rigorously)
- Flexible (i.e. easy to modify, can be re-used for similar applications)
- Efficient (i.e. use of efficient formulas)

Generally

- Don't hardcode numbers into formulas (e.g. reference cell with 10% rather than writing 10%)
- Formulas that perform the same function must be consistent (e.g. \$D\$12 etc.)

Understandability

- Use meaningful report titles, row labels and column headings
- Where all values are in 1000's of units, put this in the title
- Use range names in formulas

Types of references

- Relative (e.g. D14)
- Absolute (e.g. \$D\$14)
- Mixed (e.g. D\$14, or \$D14)
- Range name (e.g. sales)

Developing models

Programming as engineering

- When we program, we create a 'product' (i.e. like engineering we create something well designed)
- Poorly designed software is:
 - o Error prone
 - o Complicated
 - o Hard to maintain
 - o Not well documented
 - o Not based on acceptable standards

Separation of duties

- Want to ensure that development is rigorous and reliable
 - o I.e. do not evaluate your own ideas, don't test own program, don't test using live data

Programming guidelines

- Understand how users will use the software (design for other people, make self-explanatory)
- Minimise complexity (don't try to do too much)
- Design in layers (stratification – separation of interface, data and formulas)
- Minimise communication between layers (**loose coupling**)

- Use industry standard conventions
- Have someone else test your work

Design guideline

- Use a stratified design
 - o multiple sheets, one sheet per function, provide cover sheet
- Calculate a value once where possible (don't repeat calculation in multiple sections)
- Use **loose coupling** (make sheets as independent as possible, change to one sheet should have minimal impact on others (one-way communication between blocks))

1. Documentation sheet contents page

- Introduction: identifies main purpose of the model, provides the user with a map of the layout of model
- Instructions: explains how to operate the model
- Assumptions: lists any assumptions that are built into the model
- Names used: identifies any range names defined, identifies any cells linked to other spreadsheets

2. Input (data) sheet

- Contents: data only
- Design: input area should look as much as possible like the manual form its replacing
- Benefits: cleaner and easier for others to use
- Dedicated input areas reduce the chance of writing over formulas, entering data values in incorrect cells

3. Logic (calculation) area

- Use as a 'repository of complex calculations'
- Advantages: one-way dependency, changes can be made to the layout of the report without affecting logic area and allows the logic to be split into smaller modules

4. Report area

- Report layout should be designed first – input and logic areas can then be designed to complement the layout of the report area, most future changes will be made in this section
- If the report is separate, can add row, compress a section etc. without changing the model itself

Minimising errors

Types of errors (quantitative)

- Mechanical errors (i.e. simple mistakes; typing errors, wrong number, reference to wrong cell)
- Logical errors (i.e. wrong algorithm or incorrect explanation of algorithm)
- Omission errors (i.e. omit a variable or parameter – very low detection rate)

Types of errors (qualitative)

- These are issues likely to induce errors in the future (

- Poor model layout/design
- Poorly designed formulas
- Poor or non-existent model documentation (i.e. unprotected worksheet)

Smelly spreadsheets

- Design unhelpful/confusing to user (poor use of colour, inconsistent layout)
- Design hard to maintain (inputs, calculations, outputs on one sheet)
- Complex formulas (multiple data sources, many operations in single formula)

Auditing spreadsheets

Validity problems

- Erroneous, incomplete or inconsistent input data
- Inconsistent or incorrect formulas (hard to detect if error is intermittent)
- Incorrect output (wrong data source selected (copy report from other document but linked to old one))

Control procedures

Legislation that affects internal control

- US foreign corrupt practices act (FCPA)
 - Illegal to influence anyone with any personal or rewards
 - US cannot blacklist foreign companies so that they cannot trade with the USE and freeze assets
- Australian Tax Law
 - Businesses must process and retain adequate and correct records of their activities for GST and Tax return purposes
 - Tax office can demand to see any historic records when auditing
 - If records are missing, ATO can use its own estimates of revenue and expenses
- Australian Criminal Code
 - Penalty for bribery as either 3 x benefit received or 10% of company turnover whichever is greater, and also possible prison sentence

Control typologies

The hierarchy of controls

- Typically a pyramid structure
 - Lower level employees report to supervisors, supervisors report to managers, managers to executives, executives oversee each other, also report to shareholders
- For key controls to be effective
 - Some elements of control that exist at low level must be present in the higher levels
- Many normal management functions fit concept of a control
 - Budget is a form of 'feed forward' control

- Salary bonuses based on result as a form of feedback control

Control functions and categories

Control functions

- Prevention
 - Hiring policy
 - Controlling access to resources
- Detection
 - Video surveillance
 - Reconciliation
- Correction
 - Maintaining backup files
 - Resubmission of documents

These control functions can be achieved via:

General controls

- Controls over organisations environment; security, software development, hiring

Application controls

- Controls over transactions
- Apply to data input, processing and output (input validity, input completeness, input accuracy, update completeness, update accuracy)

Tension between benefits and costs of controls

Benefits of controls

- Reduce probability of an adverse event occurring (risk)
- Reduce loss when adverse events occur
- But note: few controls reduce the probability of an adverse event occurring and loss at the same time

Costs of controls

- Can be significant cost to retro-fit controls to existing processes
- Controls can be expensive to operate/enforce
- Strict rules may make business less agile/responsive

Knowledge of objectives and risks for control systems

1. To identify the correct **control**, you must know what **risks** are present in the environment being controlled
2. To know what **risks** are present, you need to know which **objectives** you want to achieve
3. Therefore:
Objectives → risks → controls

Management of risks requires considering...

- How we do business

- Objectives (i.e. where we want to be)
- Events we want to change
- Risks we face, and how we should respond to risks
- How we want to manage events and risks (control activities)
- The information we need and gather and give out to conduct and manage the business
- How we will monitor what is happening and our progress towards goals

Specific controls: separation of duties in accounting

Separation of duties is critical

- Custody: handling cash, inventory, tools, trade samples, other valuable assets
- Recording: data entry, prepare source documents (e.g. purchase order, journal entry slip)
- Reconciliation: prepare cash, payable, receivable reconciliations, prepare performance reports
- Authorization: approve transactions
- Note: if there are only 3 employees available, recording and reconciliation can be combined – as authorization will still be independent as the final stamp of approval

Why separate?

- Recording from reconciliation: prevents falsification of records (but if you are just recording and reconciling then fraud is hard to commit)
- Custodial from recording: prevents falsification of records
- Custodial from authorization: prevents authorization of fictitious transaction
- Recording from authorization: prevents covering up false transaction

ERP Systems

Data and information

Enterprise Resource Planning: A common type of transaction processing system

Combination of centralized (integrated) data storage

Workflow management

- Allocate a task to someone
- When that is finished allocate the flow on task

ERP Advantages:

- Integration of an organization's data and financial information: Data is captured once, available everywhere
- Potentially improved processes (eg industry best practice customer service, inventory manufacturing)
- Different solutions for different size organizations and different models
- Greater management visibility, increased monitoring
- Better access controls

ERP Disadvantages:

- Cost
- Time consuming
- Changes to organizations existing business processes can be disruptive
- Complex
- Resistance to change

1. Data input

Data Input – Capture

Data must be collected about four facets of each business activity as it occurs

1. Which activity is performed
2. Which resources are affected
3. People who participate
4. When the activity occurred

Typical accounting input: Journals

General, which are used for infrequent transactions and specialised, and repetitive transactions such as sales

Paper based source documents are uncommon however could be a sales order form

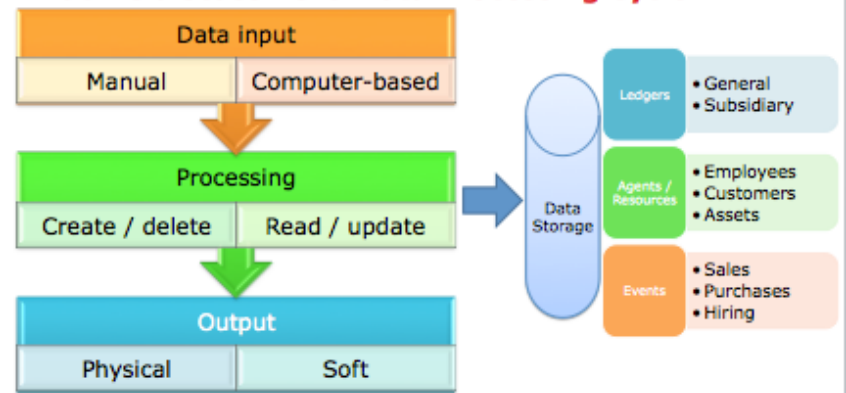
Advantages:

- Cheap, easiest to operate a small business

Disadvantages:

- Data eventually needs to be entered into an AIS
- No interactive data entry

What we discuss next: Data Processing Cycle



A common system turnaround documents

- Document sent from organisation to customer
- Same document is returned by customer to organisation

Computer based data input

Trade off: want data entry to be efficient, accurate and valid

- But ensuring accuracy is time consuming
- Efficient to allow free input via keyboard
- More accurate to restrict input

Can use batch processing

- Group documents together (e.g. timecards)
- Manually add numbers to check across all documents (e.g. add together employee ID codes)
- Key in documents to computer
- Check computer generated total against batch total

Long term trend to offload data entry to customer

- Balancing act between offloading this data and maintaining data quality

Ensuring accurate data input outside the business

- Pre-fill a form (data less likely to be wrong , mistakes can be corrected by customer)
- Database lookup (e.g. shows details when ID is entered)
- Within a form, use Check digits
 - o Within an ID number (e.g. credit card) include one or more digits that are mathematically derived from other numbers

Other accuracy measures: coding techniques

Sequence / block

- Items numbered consecutively
- Specific range of numbers is associated with a category
 - o In chart of accounts maybe 100-199 = Fixed asset

Group

- Positioning of digits in code provides meaning

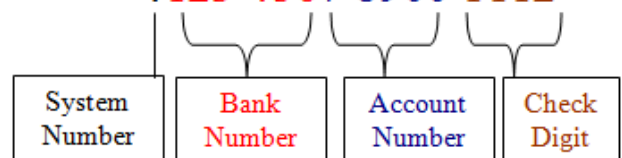
Mnemonic

- Letters and numbers
- Easy to memorise
- Code from description of item

Sample Card Number

4123 4567 8900 1112

4123 4567 8900 1112



1.2. Data storage

Ledgers

General

- Summary level of data for each:
Asset, liability, equity, revenue and expense

Subsidiary

- Detailed data for a general ledger (control) Account that has individual sub – accounts
 - o Accounts receivable
 - o Accounts payable

How is data stored in a database?

In linked lists / tables of data

- layout a bit like a spreadsheet (i.e. rows and columns)
- Cross references to minimise duplication

Transaction file

- Contains records of a business from a specific period of time
- Refers to master files

Master file

- Permanent records
- May be updated by transactions
- Does not refer to transaction file

2. Data processing

Four main activities

1. Create new data records
2. Read retrieve or view existing data records
3. Update existing stored data records
4. Delete data or records (this is not normally advised in an accounting system)

3. Data output

Information output types

Soft copy (displayed on a screen)

Advantages

- Low production, handling and storage cost
- No physical copy, so does not degrade

Disadvantages

- Must have compatible software and hardware access

Hard copy (paper documents and reports)

Advantages

- Visible. Can be used as a prompt action
- Can be used without specialised technology

Disadvantages

- High production, handling and storage cost

Flowcharts and data flow diagrams

What is documentation

In a sense, the system is the organisation

- Procedures, data input screens/forms, data stores, reports

Documentation explains

- What is there (i.e. has what is called an *ontological* purpose)

Typical process documentation

- Narratives, data flow models, flowcharts

Describes who, what, why, when and where of systems

- Input process, storage, output and controls

Why learn documentation

- Need to be able to read documentation in all its forms: narratives, diagrams and models
- You needs to be able to evaluate the quality of systems such as internal control based in part on documentation

Flowcharts

Explained

- Use symbols to logically depict transaction processing and the flow of data through a system
- Using a pictorial representation is easier to understand and explain versus a detailed narrative

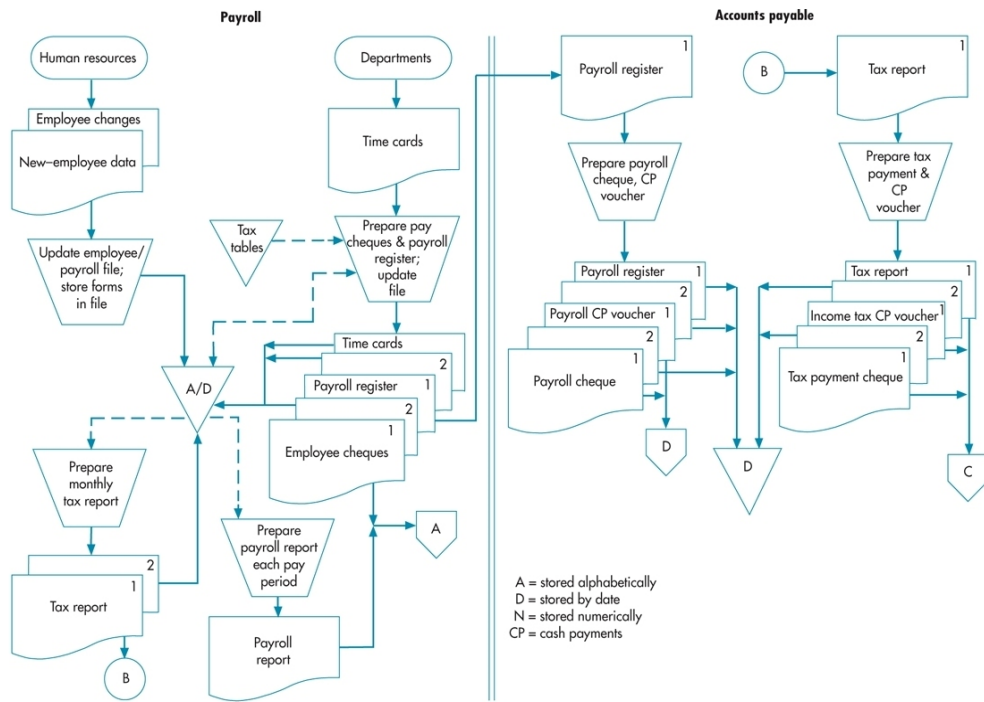
Flowchart Symbol Categories

Symbol	Name	Explanation	Symbol	Name	Explanation
Input/Output Symbols					
	Document	A document or report.		Auxiliary operation	A processing function performed by a device that is not a computer
	Multiple copies of one document	Illustrated by overlapping the document symbol and printing the document number on the face of the document in the upper right corner		Off-line keying	An operation utilizing an off-line keying device (e.g., key to disk, off-line cash register)
	Input/output; Journal/ledger	Any input or output function on a program flowchart. Also used to represent accounting journals and ledgers in a document flowchart	Storage Symbols		
	Display	Information displayed by an online output device such as a terminal, monitor, or screen		Magnetic disk/drive	Data stored on a magnetic disk or drive
	Online keying	Data entry by online devices, such as a terminal or personal computer		Magnetic tape	Data stored on a magnetic tape
	Terminal or personal computer	The display and online keying symbols are used together to represent terminals, personal computers, and other electronic devices capable of both input and output		File	File of documents manually stored and retrieved; following letters indicate file-ordering sequence: N = numerically, A = alphabetically, D = by date
	Transmittal tape	Manually prepared control totals; used for control purposes to compare to computer-generated totals	Flow and Miscellaneous Symbols		
Processing Symbols				Document or processing flow	Direction of processing or document flow; normal flow is down and to the right
	Computer processing	A computer-performed processing function; usually results in a change in data or information		Data/information flow	Direction of data/information flow; often used to show data copied from one document to another
	Manual operation	A processing operation performed manually		Communication link	Transmission of data from one geographic location to another via communication lines
				On-page connector	Connects the processing flow on the same page; its usage avoids lines crisscrossing a page
				Off-page connector	An entry from, or an exit to, another page
				Terminal	A beginning, end, or point of interruption in a process or program; also used to indicate an external party
				Decision	A decision-making step; used in a program flowchart to show branching to alternative paths
				Annotation	Addition of descriptive comments or explanatory notes as clarification

Types of Flowcharts

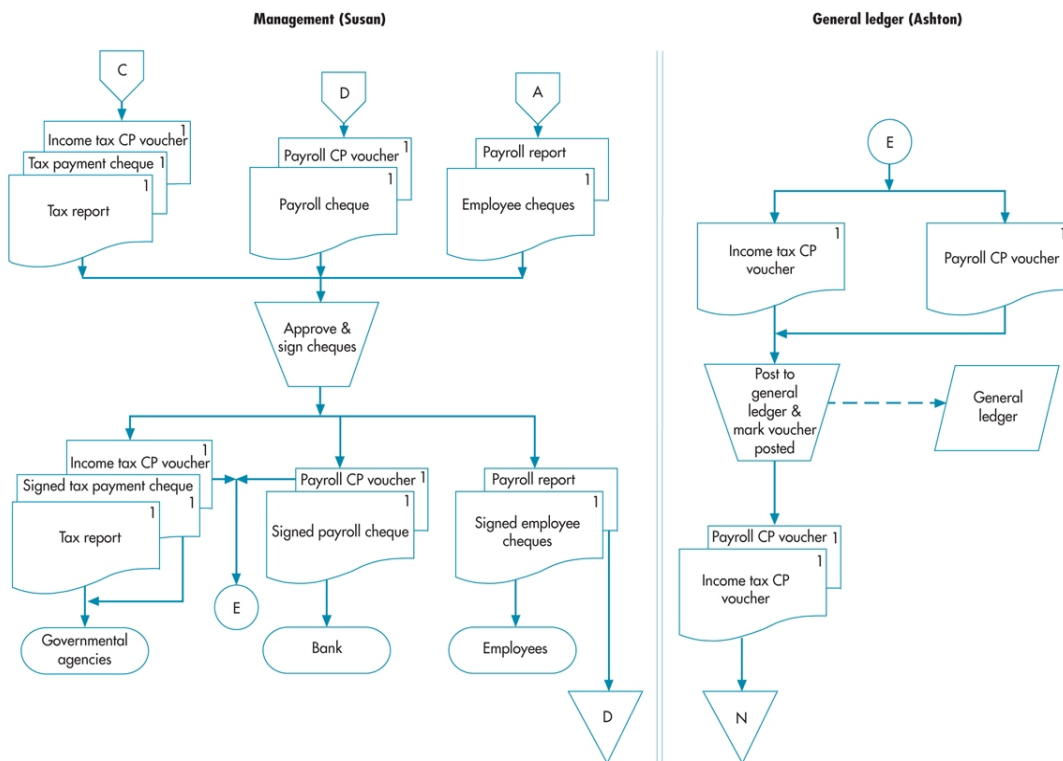
Document:

- Illustrates the flow of documents through an organisation
- Useful for analysing internal control procedures.



System:

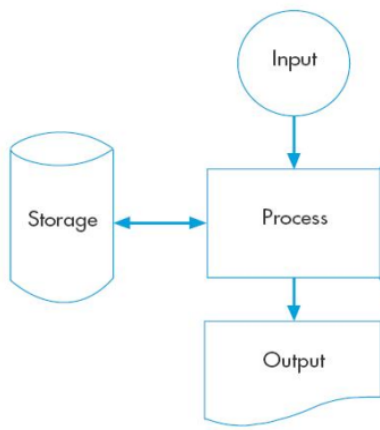
- Logical representation of system inputs, processes and outputs
- Useful in systems analysis and design.



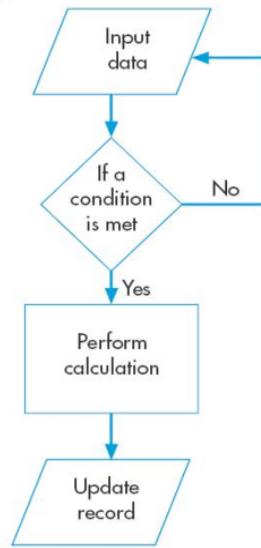
Program:

- Represent the logical sequence of program logic.

System Flowchart



Program Flowchart



Data Flow Diagrams

*Notes on this are in handwritten 'Comp Lab week 8'

Graphically describes the flow of data within a system

There are four basic elements:

External Entity: a source of data or input into the system or output from the system to a destination

- This will be graphically depicted with a SQUARE BOX (blue in diagram below)

Data Flow: Movement of data to/from external entity, process, or data store. Label should describe the information, not the activity (customer invoice, NOT invoice customer)

- This will be graphically depicted as an ARROW (red in diagram below)

Data Store: A static storage area (e.g. a filing cabinet). Data never moves from one filing cabinet to another by itself. Always needs a process (i.e. a person/computer) to move.

- This will be graphically depicted as two lines with no arrows (green in diagram below)

Task/process: **Physical DFD:** A person who processes and **Logical DFD:** A data processing task

Physical vs. Logical DFD

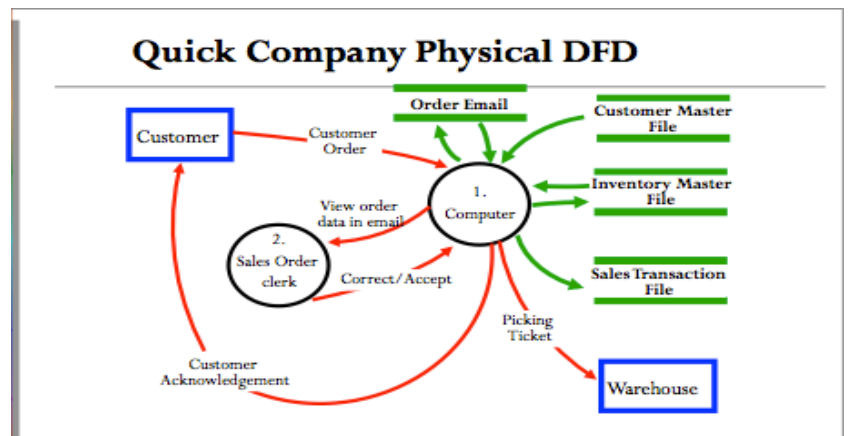
- This will be graphically depicted with a CIRCLE (black below)

1. Physical DFD

- Shows who processes information
- Internal entities are given the names of persons or objects (e.g. Sales Clerk, Computer).

2. Logical DFD

- Shows the sequence of activities and how information flows from one activity to another.
- Each internal entity is an activity that transforms the data in some way (e.g. from purchase requisition to purchase order)



Pros and Cons of DFDs

Pros

- promotes quick and relatively easy project code development
- Method is easy to learn
- Easy to read

Cons

- DFDs for large systems can become cumbersome, difficult to translate and read, and be time consuming to construct

Data Flow Diagram levels

Context:

- Highest level (most general)
- Purpose: show inputs and outputs into system
- Characteristics: one process symbol only, no data stores.

Level-0:

- Purpose: show all major activity steps of a system
- Characteristics: processes are labelled 1.0, 2.0 and so on.

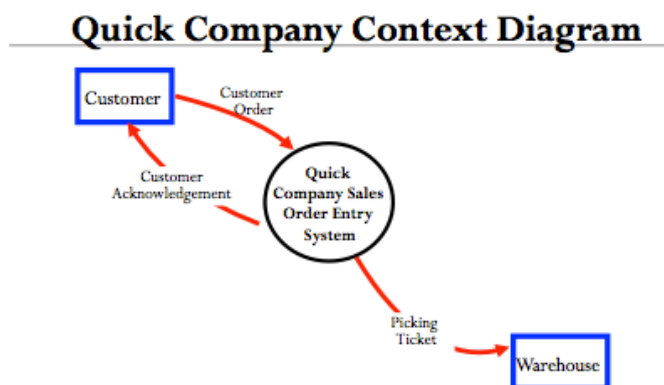
Level-1:

- Purpose: show one major activity divided into sub-activities
- Characteristics: processes are labelled 1.1, 1.2 and so on.

DFD Creation Guidelines

1. Understand the system.
2. Determine system boundaries.
3. Develop a context DFD.
4. Identify data flows.
5. Group data flows
6. **Identify transformational activities.**
7. Group transformational activities
8. Identify all data stores.
9. Identify all sources and destinations.
10. Label all DFD elements.
11. Subdivide DFD.
12. Give each process a sequential number.
13. Repeat the process.
14. Prepare a final copy.

Quick Company Context Diagram



Example of a Quick Company Narrative

This includes all data flows and files.

The Quick Company is a small manufacturing and mail-order sales operation. **Customer** (external entity) orders are received by email. The sales order computer receives these orders, where sales order clerks view the orders and review them for accuracy. This review involves checking that the customer exists, that the delivery address is the customer's, and that the goods are available (comparison to data stored in the customer and inventory master files). Following this review the clerk then approves or rejects the order. The order is then recorded in a sales transaction file, and the inventory available balance is updated. As the order is recorded, it is printed on a printer in the **warehouse** (possible external entity) (the picking ticket). A copy of the sales order is also emailed to the customer (a customer acknowledgement).

Naming Conventions

Physical DFDs

Each file and data store labelled using the name of the document or other data source that is being transferred or stored (e.g. invoice).

Label may also indicate the type of storage.

Logical DFDs

Names show what the information represents (some forms have multiple purposes. Each purpose will have a different name in an logical DFD).

Files will NOT indicate the type of storage

Typical Logical Processes

Capture

- Exists if processing needed to record transaction in a format suitable for internal processing (i.e. not needed if data already entered).
- Typical activities: Edit, Respond

Validate

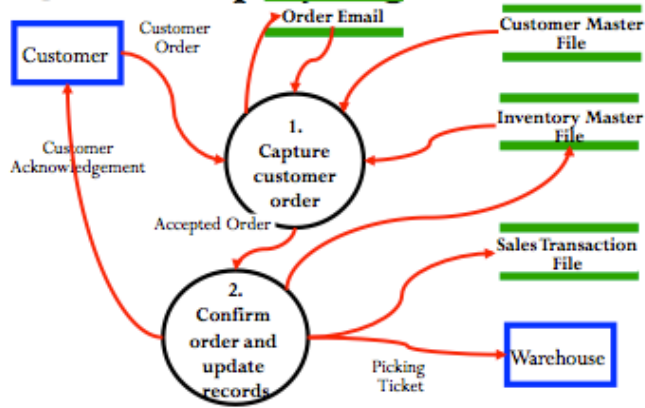
- Check customer existence and credit worthiness
 - Verify transaction details
 - Show terms (e.g. cash/credit), quantities to be shipped and/or placed on backorder

Execute

- Give/Get relationship becomes formalised (recognised in accounts)
- Goods shipped, payment possibly received
- Generate Output

Quick Company Logical DFD

Quick Company Logical DFD



Errors to watch for

1. Black Hole: a process with only input flows
2. Miracle: a process with only output flows
3. Gray Hole: insufficient inputs to produce the needed output
4. Tardis: a logical data flow that goes from a higher to a lower numbered process (numbering indicates timing)
5. Magic: A file that moves by itself from one data store to another
6. Break and enter: External entities cannot usually store data in a file or retrieve data from a file directly

Excel based risk management techniques

Introduction to decision analysis

- We face numerous decisions in life & business
- We can use computers to analyze the potential outcomes of decision alternatives
- A computer model is a set of mathematical relationships and logical assumptions implemented in a computer as an abstract representation of a real-world object of phenomenon
- Spreadsheets provide the most convenient way for business people to build computer models

Benefits of modelling

- Economy - It is often less costly to analyze decision problems using models.
- Timeliness - Models often deliver needed information more quickly than their real-world counterparts.
- Feasibility - Models can be used to do things that would be impossible.
- Models give us insight & understanding that improves decision making.

Advantages of Models

- Modeling allows **experimentation**
- Generally, **experimenting** with models (compared to experimenting with the real situation):
 - requires *less time*
 - is *less expensive*
 - involves *less risk*
- The more closely the **model** represents **the real situation**, the more accurate the conclusions and predictions will be.
- But reality is normally not feasible to model fully
 - Just concentrate on parameters known to be important
 - Remember that inputs are just estimates

Base Case analysis

- Base case can describe one or more of the following:
 - current policy
 - most likely scenario
 - best or worst case scenarios
- Answers questions such as:
 - If we follow last year's plan, how much profit should we expect next year?
 - How many items do we expect to sell next week?

What if (sensitivity) analysis

- This is a data sensitivity tool
 - One variable data tables
 - Two variable data tables

Overview

- Examines how **sensitive** the results of an analysis are to changes in the assumptions
 - i.e. analyzes how outputs vary with changes in one or more inputs to determine which inputs have the greatest impact on results (these are "critical" parameters)
 - May vary a parameter, a decision variable, or the model structure
 - May be used as part of debugging process
 - If output is unexpected we have uncovered either a bug or an insight
- Small changes in input may cause in large changes in results (**HIGH SENSITIVITY**)
- Large changes in input may produce little change (**LOW SENSITIVITY**)

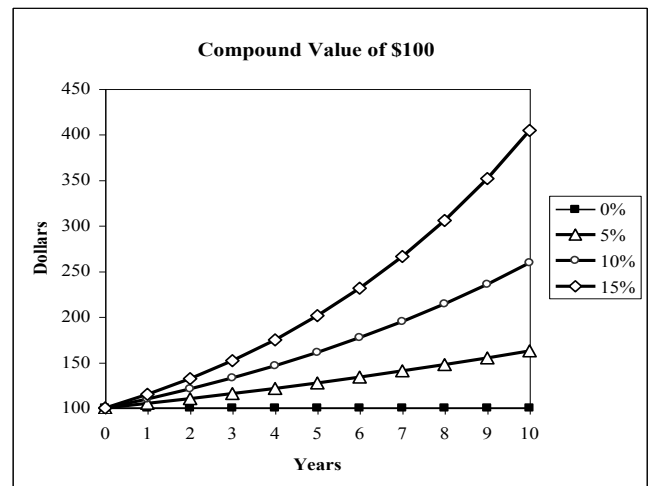
Varying inputs of processes

- Inputs: ask *what if* given information were different
 - Tests numerical assumptions of model by varying inputs
- Process: vary algorithm to simulate different processes
 - E.g. IRR change by using Reducing balance method vs. straight line method

Financial formulas – introduction to capital building

Compounding interest

- Compound interest
- This is graphically represented by the graph
- The quoted annual rate is known as the **nominal rate** (e.g. $J\%$ per annum)
- If interest is compounded m times per year at j/m % per period, the effective annual rate is always higher than the nominal rate
- **Effective rate** = $(1 + j/m)^m - 1$



Future values vs. Present values

- For purchase of equipment costing \$1000 in 1 years time – how much do I need to put in a bank account now
- $FV_n = P_0(1 + i)^n$
- $PV = P_0 = FV_n / (1+i)^n$
 - Where 'i' is the interest rate per period, and
 - n = no of periods
- Future value = investment with compound interest added
- Current value = investment with compound interest removed

Discounting

- Finding the initial deposit required to yield a specified amount at a future point of time is 'discounting'
- E.g. \$1 000, payable in 1 year's time, discounted at 8% has a present value of \$925.93
- Therefore P_0 is replaced by PV
- $PV = FV_n / (1 + i)^n$
- Or
- $PV = FV_n(1 + i)^{-n}$
- This formula tells us how the present worth of a given \$ amount decreases according to:
 - How far in the future its received
 - The discount rate (or cost of capital) used

Net present value

- Over a number of years, you might have a series of inflows (income) and outflows (payments)
- Definition: the sum of all outlays in present value terms
- Need to value each year differnetly to account for time value of money
- Use NPV function
- Whereby: Upfront – front flow + NPV (interest, flow from period 2 onwards)

- Note: NPV assumes that first cash flow is one period from now
-

Cost of capital

- A secure rate of return available in an alternate investment (opportunity investment)
- The cost of borrowing the money

Annuities

- Contracts requiring the payment of equal amounts first assumed importance in the insurance field
- Actuaries have derived mathematical formulae and tables which permit the compound value and the present value of an annuity to be easily found

Periodic payment

- This can be done using excel's PMT function
- Calculates periodic repayment on a loan (principal) at a given interest rate for a specified number of repayments
- E.g. loan amortisation

Internal rate of Return

- The internal rate of return IRR represents the effective interest earned on the investment
- The internal rate of return, therefore, is defined as the discount rate at which NPV equals zero
- The only way to solve this problem is for a computer or a calculator to iterate to the answer

Why install or change systems?

- User or business changes
- Technology changes
- Regulatory changes
- To improve business process
- Create competitive advantage
- Increase productivity gains
- Integrate multiple systems
- Aging systems need replacement
- Develop quality, error-free software

Project success and failure

- One-Tel (\$650 mil turnover)
 - o Billing system redesign caused significant billing errors and led to corporate collapse
- Fox-Meyer (\$5 billion share value)
 - o Enterprise system (SAP) implementation not tested before going live
 - o Complete failure of business processes for months led to bankruptcy and firm closure
- Philadelphia unemployment compensation system
 - o Spent \$170 mil. Abandoned on 31.7.13, \$60 mil over budget and 42 months behind schedule

Theories informing system development life cycle

Agency Theory

- the separation of owners (principals) and managers (agents) creates incentives for managers to act opportunistically and for owners to implement monitoring systems to prevent opportunism

Expected utility theory

Expected utility by theory

- People are rational. An individual will choose one project (uncertain outcome) over another because the expected utility is greater
 - o Utility is affected by feasibility: Economic, Technical, Legal, Scheduling, Operational
- Methods used to calculate expected economic feasibility
 - o Payback period (total cost / revenue or savings per year)
 - o Net present value
 - o Internal rate of return

How the presentation of information affects behaviour

- Sunk costs on a project should be irrelevant, but how a situation is framed affects responses
- People are **risk averse** when choices expressed as possible **gains**
 - o Project A: revise existing system to improve processing speed

- Projected result: a sure gain of \$100
- Project B: replacing existing system with new technology providing new capabilities
 - Projected result: 50% chance to gain \$200 (software update)
50% chance to gain \$0 (if serious problems)
- Most people choose Project A
- **Risk seeking** when the choice is between possible **losses**
 - E.g. Project option: 1. Cancel immediately and write-off \$100, or
2. Continue, giving 50% chance to lose \$200
50% chance to lose \$0

System failure due to change

- Even the best systems are likely to fail without the support of the people it serves
- Why people resist change:
 - Fear
 - Lack of top management support
 - Experience with prior changes
 - Lack of communication
 - Disruptive nature of change (“disruptive technology” – creates uncertainty)
 - Methods of instituting change (when end users aren’t educated on intended use)
 - Biases and emotions
 - Personal characteristics and background

Types of resistance

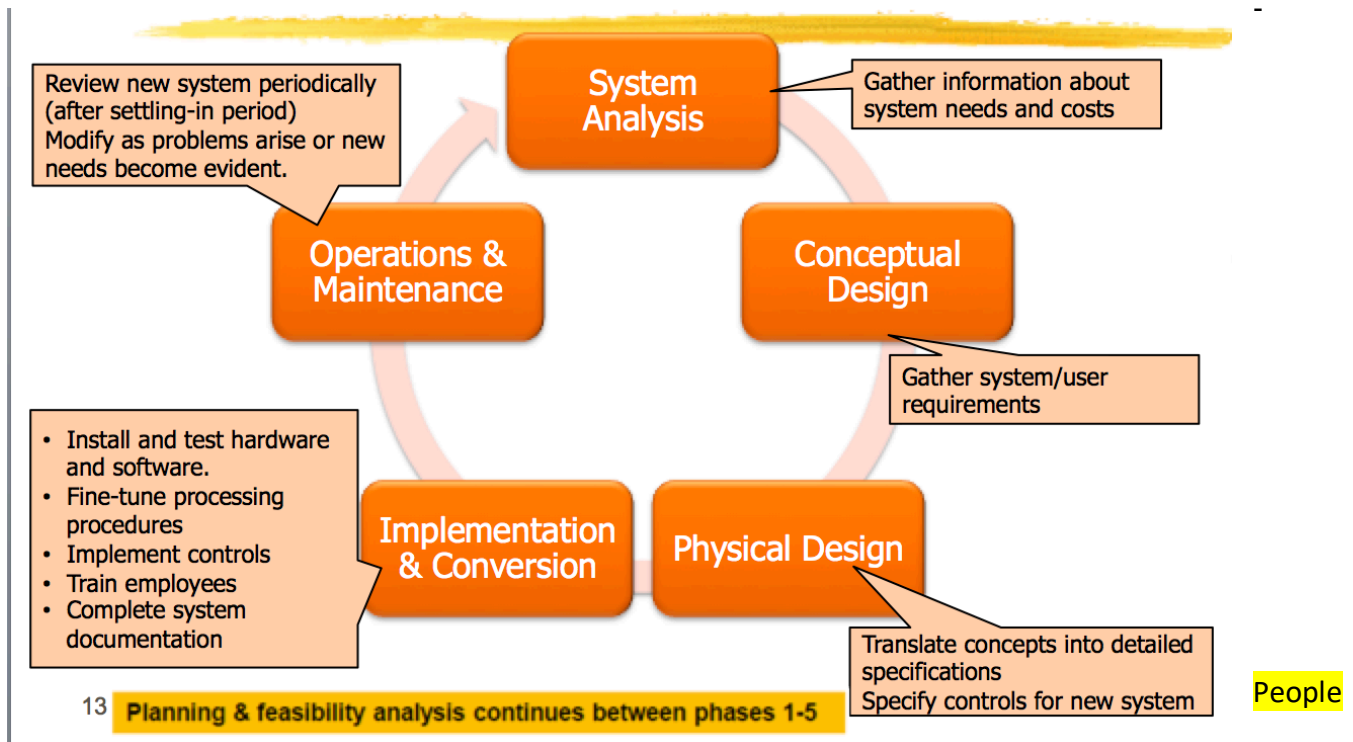
- Aggression: behaviour that destroys, cripples or weakens system effectiveness, such as increased error rates, disruptions or deliberate sabotage
- Projection: blaming new system for everything that goes wrong
- Avoidance: ignoring a new AIS in the hope that problem (system) will eventually go away

Preventing resistance

- Obtain management support
- Meet user needs
- Involve users (participation leads to ‘ownership’)
- Stress new opportunities
- Avoid being too emotional
- Provide user training
- Reexamine performance evaluation to make sure they are aligned with new system
- Keep communication lines open
- Test system
- Keep system simple and humanize it
- Control users expectations

Other concrete reasons for system project failures

- Poor risk management
 - o Too ambitious (design too complex, too much functionality)
 - o No development methodology
 - o New technology
 - o Lack of testing
- Poor leadership
 - o Frequent design changes
 - o Poor change management
 - o Uncertain or conflicting goals
 - o Lack of senior management support



interacting in System Development Life Cycle (SDLC)

- Management
- Accountants (responsible for design of internal control systems – they are important)
 - o Determine information needs and system requirements
 - o Help manage systems development
 - o Design system controls and periodically monitoring and testing the system
- Other users
- Information systems steering committee
- Project development team
- Systems analysts and programmers
- External players

Planning systems development

- Planning is crucial for systems development projects
- Planning can help a new system achieve:
 - o Consistency (to overall original strategic plan)

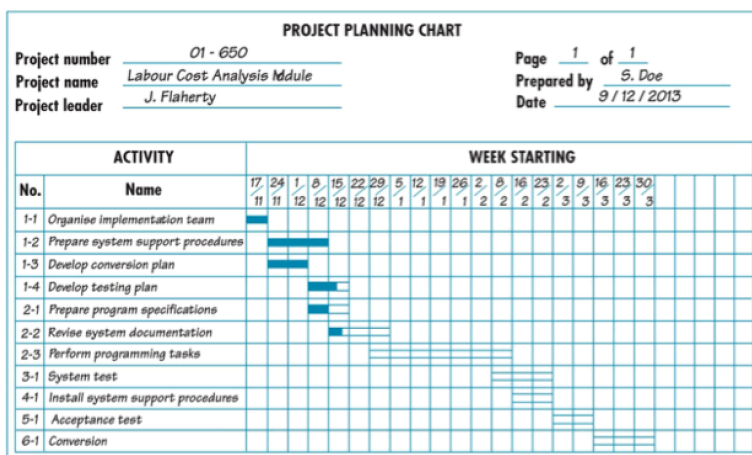
- Efficiency
- Cutting edge technology
- Lower costs (avoid duplication & wasted effort)
- Adaptability (for future resource needs & changes)

Types of systems development plans

1. Individual project development plans
 - Cost/benefit analysis
 - Developmental and operational requirements (people, hardware, software, and financial)
 - Schedule of activities required to develop and operate a new application
2. The master plan developed by the information systems steering committee
 - What a system will consist of?
 - How it will be developed?
 - Who will develop it?
 - How needed resources will be acquired?
 - Where the AIS is headed?

Commonly used planning technique – GANTT chart

- This is a bar chart with project activities on the left-hand side and units of time across the top
- Shows entire schedule for a large, complex project
- Note: from the picture below – each process is broken down into sub-steps, and this shows the way they are going to be implemented



System Analysis Activities

1. Initial investigation

Common methods to gathering data

- Interviews
- Questionnaires
- Observation

- Review systems documentation

2. System survey

- Involves an extensive study of the current AIS with the objectives for various reasons

3. Feasibility study

4. Information needs and system requirements

Identify information needs and system requirements

- Once project is deemed feasible, identification of information needs for users is the next step
- This requires:
 - Business process descriptions
 - Data elements & structure
 - Outputs
 - Inputs
 - Documentation
 - Constraints
 - Controls
 - Reorganizations

5. Systems analysis report

- Executive summary
- System goals and objectives
- System problems and opportunities
- Project scope
- Relationship of project to overall information systems strategic plan
- Current system operation
- User requirements

Calculating economic feasibility

- Simple payback is most common method
- Disadvantage: does not take into account the time-value of money
- Advantage: simple and cost-effective
 - Numbers are only estimates
 - Taking into account time-value of money is complicated and exact calculation makes numbers seem more certain than they are

Calculating time value of money

This can be done using the 'function arguments' excel function

- **Future value**
- Increase the value of an investment by the interest rate
- Increases are cumulative

one period: $100 + 10\%$

$$= 100 * 1.1 = 110$$

two periods: $100 * 1.1 * 1.1$

$$= 100 * 1.1 = 110 * 1.1^2 = 121$$

- **Present value**

- Remove accumulated interest

(if we have \$121 in 2 years time, what did we start with?)

One period: $\$110 / 1.1 = \100

Two periods: $\$121 / (1.1^2) = \100

Assumptions made in economic feasibility analysis

All models simplify reality to make the problem to be solved traceable

- E.g. A couple decide to invest a monthly amount so that they can withdraw \$2,500 per quarter during the child's 13th, 14th, 15th, 16th, 17th, and 18th years to pay for secondary school fees.
- The interest rate on deposits is 4% per year, compounded monthly during the first 12 years.
- This problem can only be solved by making simplifying assumptions

Present value vs. Net Present Value

- NPV also calculates the value of an income/expense stream
 - o Still assumes that the interest rate is constant
 - o Still assumes evenly spaced payments
- BUT
 - o Assumes that 1st flow is at the end of period 1
 - o Does not assume that each payment/receipt is the same

Comparing rates of return

Expected utility:

- An individual should choose one project (uncertain outcome) over another when the expected utility is higher
- Choose higher rate of return regardless of \$ return

Calculation

- The internal rate of return IRR = effective interest earned on the investment
- IRR = the discount rate at which NPV is equal to zero
- Only way to solve this problem is for a computer to iterate the answer

Evaluating system design alternatives

- The system development team must continually make design decisions, including on the following approaches to the development process
 - o Purchase software from a vendor
 - o Design the system in-house, or
 - o Outsource to develop and manage the information system
- The design alternatives can be evaluated in respect to:

- How well it meets organisational and system objectives
- How well it meets user needs
- Whether it is feasible
- What its advantages and disadvantages are

Preparing conceptual Design

Specifications

Output:

- How often?
- What should reports contain?
- What should reports look like?
- Should reports be online or hard copy or both?

Data storage:

- What data elements must be stored to produce a report?
- How they should be stored?
- What type of file or database should be used?

Input:

- Where, when and how to collect data?

Processing procedures and operations

Report

At the end of the conceptual design phase, a conceptual systems design report is prepared to:

- summarise conceptual design activities
- Guide physical systems design activities
- Communicate how management and user information needs will be met
- Help the steering committee assess system feasibility

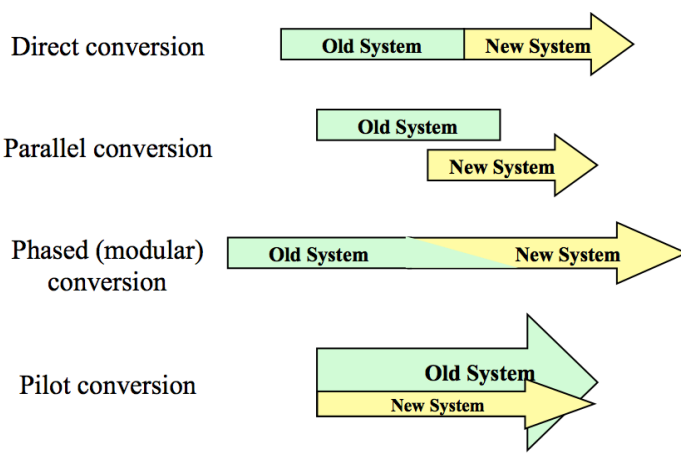
System physical design

- Output
- File and database
- Input
- Program
- Procedures
- Controls

Output design

- Determine nature, format, content and timing of reports, documents and screen displays

Introducing new software:



Direct conversion

- User stops using old system one day and begins using the new system next
- Adv: fast and efficient
- Disadv: risky, can seriously disrupt operations if new system doesn't work first time

Parallel conversion

- Continuing to process data on old system while some / all data is processed on new – compare systems
- Adv: less risky, offers a fallback position
- Disadv: expensive, unsuitable for some systems (e.g. after reengineering)

Phased (modular) conversion

- Used with larger systems
- System is broken into modules that can be implemented separately at different times
- Adv: insulates majority of system components from serious problems, can use in conjunction with direct method, parallel method or both
- Disadv: very time consuming

Pilot conversion

- New system will be used first by only a portion of the organisation, often at a separate location
- Adv: quarantines system failure, risky system development projects are more feasible
- Disadv: only applicable where same type of task is performed in different parts of the organisation

Revenue Cycle

Underpinning system cycle theories

- Theory of the firm:
 - All system cycles process many transactions or contracts.
 - Without an organisation mechanism one owner would not be able to handle millions of transactions per day.
 - Efficiencies are achieved in business processes by use of accounting information systems.
- Agency theory:
 - Owners (principals) pay managers (agents) to run business on owners' behalf.
 - Principals try to ensure agents are acting on their behalf by
 - Embedding controls
 - Setting up incentive systems (feedforward)
 - Monitoring information received from managers (feedback)
 - Accounting information system provides reports.

Introduction

A set of exchange transaction contracts between the firm and its customers associated with:

- Providing goods and services to customers
- Collecting their cash payments

The primary objective of the revenue cycle

- To provide the right product in the right place at the right time for the right place

Links to other cycles

- Information about revenue cycle activities flows to other accounting cycles: e.g.
 - Expenditure and production cycles
 - Human resources cycle / parallel subcycle
 - General ledger and reporting cycle

Data Flows Between Revenue Cycle And Other Transactional Cycles:

Initiating cycle	Receiving cycle	Flow description
Revenue	Production	Sales staff send forecasts to production planning staff
Production	Revenue	Production planning staff provide details of the requested goods availability to sales staff to use when planning their future activities, and communicating with customers
Revenue	HR management & payroll	Sales management send details of sales commissions earned to payroll staff for use when calculating salary and wages payable
Revenue	General ledger & reporting cycle	Accounts receivable staff send details of invoices raised by the billing system and payments received from customers to the finance staff to enable updating of the general ledger and the subsequent financial reporting

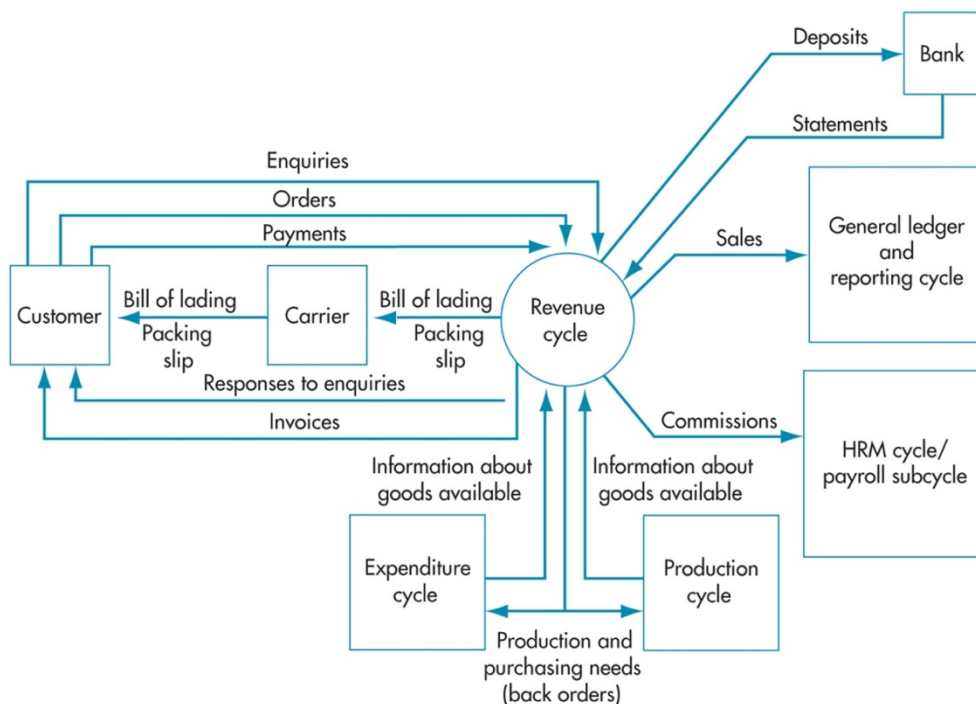


FIGURE 7.2
The context diagram of the revenue cycle

Revenue Cycle Decisions

- Decisions required to be made in the revenue cycle
 - o Should we **customize** products?
 - o How much **inventory** should we **carry** and where?
 - o How should we **deliver** our product
 - o How should we **price** our product
 - o Should we give customers **credit**? If so how much and on what terms?
 - o How can we process payments to **maximize cash flow**?

Business activities: the revenue cycle

There are 4 main business **activities** performed in the revenue cycle

- Sales order entry
- Shipping (sales fulfillment)
- Billing and accounts receivable
- Cash collection

Three basic functions are performed in each activity:

- Capturing and processing data
- Storing and organizing data for decisions
- Providing controls to safeguard resources (including data)

1. Controls in the sales order-entry process

Sample order-entry problems

E.g. A data entry clerk keys 91 instead of 19 when entering a sale that will clear an obsolete item from stock (at a heavy loss). The result is an incorrect delivery amount and eventual over-stocking of a loss-making item.

E.g. An employee makes a credit sale to a customer who is already four months behind in making payments on the account (Chapter 17)

E.g. Customers are billed for the quantity ordered, but the quantity shipped is actually less because some items have been back-ordered (Chapter 17)

- Data entry efficiency
- Data entry accuracy
 - o These first 2 controls can be achieved by electronic data interchange (computer to computer transfer of data)
 - o Usually part of the supply chain management system
- Data entry completeness
- Transaction validity

Entry controls

Incomplete data threat:

- Edit checks on order (accuracy and completeness check)
- Review and approval
- Perpetual inventory system

Invalid (process order should have rejected), or uncollectable

- Aging or receivables
- Customer existence check
- Credit check

- Authorization to establish credit
- Credit limits set by accounts receivable

Stockout or excess stock

- Perpetual inventory system
- Approved supplier list
- Monitor rejection / return rate
- Collect supplier performance data and evaluate regularly

Using high-volume business to business transactions

This improves data efficiency and accuracy

Called an 'electronic data interchange'

- Compute to compute transfer of data
- Usually part of supply-chain management system
 - o Companies pre-agree on trading terms (products, prices, volumes)
 - o Specialists in one of the partners (normally vendor) develops a template
 - o Whenever customer inventory falls below trigger point, order is generated automatically

2. Controls in sales fulfillment (shipping)

- Processing accuracy
 - o Have we picked the right amount of the right goods
 - o Are we shipping to the correct customer
 - o Is the shipping method correct
- Data entry efficiency, accuracy and completeness
 - o Have we entered details of activities correctly?
- Transaction validity
 - o Do all documents match? (order = picking list = shipping list = invoice)
 - o Is the shipment authorized

Typical shipping efficiency measures – LEARN

- Standardised pallet sizes
- Weigh check
- Bar code scanners
- Radio –frequency ID chips

Controls

Pick wrong item or wrong quantity threat

- reconciliation of sales order with picking list
- Bar-code or RFID in data entry

Theft from dispatch area

- Separate receiving and dispatching area
- Restrict access

Duplicate shipment or failure to ship

- Reconciliation of shipping documents with sales orders, picking lists and packing slips

- RFID system data to identify bottlenecks

3. Controls for billing and receivables

check notes from tute - handwritten

4. Controls for cash collection

Turnaround documents

- Customer returns part of invoice with payment

Electronic documents

- Invoice, remittance, and receipt all generated electronically

Electronic payment

- Transaction code used as payment identifier
- Electronic lockbox
- Electronic funds transfer EFT
- Financial electronic data interchange FEDI

Revenue cycle – information needs

Operational information

- Responding to customer enquiries
- Deciding on extending credit to a customer
- Determining inventory available
- Selecting merchandise delivery methods

Strategic decisions

- Setting prices for products/services
- Establishing policies on returns and warranties
- Deciding on credit terms
- Determining short-term borrowing needs
- Planning new marketing campaigns

AIS needs to provide information to evaluate critical revenue cycle processes

Customer service

- Response time to satisfactorily resolve customer inquiries
- Time to fill and deliver orders
- Customer satisfaction rates and trends
- Sales staff performance

Purchasing/inventory performance

- Percentage of sales orders back ordered

Receivables performance

- Bad debts expense
- Days receivables outstanding
- Remittances processed daily

Aggregate information: analyses of market share and sales trends

- Profitability by product, customer and region
- Sales volume in dollars and market share
- Effectiveness of advertising and promotions

Week 5

- We can use computers to analyse the potential outcomes of decision alternatives
- A computer **model** is a set of mathematical relationships and logical assumptions implemented in a computer as an abstract representation of a real-world object or phenomenon
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 - o Is less expensive
 - o Involves less risk
- The more closely the model represents the real situation, the more accurate the conclusions and predictions will be
- Being reality is normally not feasible to model fully
 - o Just concentrate on parameters known to be important
 - o Remember that inputs are just estimates

Scenario, sensitivity and what-if analysis

Scenario analysis

- Determine some situations that might occur
- List all changes in inputs for each situation
- Formulas typically stay the same for each scenario

Data sensitivity analysis

- Look at how sensitive outputs from a system are to changes in a single variable
- Especially useful when outputs are not a linear function of input values

Base case analysis

- Often describes one or more of the following:
 - o Current policy
 - o Most likely scenario
 - o Best or worst case scenario
- Answers questions of:

- If we follow last year's plan profit will be XX
- How many items do we expect to sell next week

Comparing results of complex analyses

Excel scenario manager

- Perform what-if analysis with more than two input cells
- Define and save sets of values as scenarios, views and change them to produce and compare different results

Requirements for running a scenario

- Well structured input and output sections
- Output demands on input through use of formulas
- Changing cells and results cells must be on the same worksheet; cannot span worksheet

E.g. Profit projections

ARTHUR'S MIXED BUSINESS PROJECTED PROFIT STATEMENT							
	Year						TOTAL
	1	2	3	4	5	6	
SALES							
Food & Drinks	20,000	22,400	25,088	28,099	31,470	35,247	162,304
Newspapers & Magazines	10,000	11,200	12,544	14,049	15,735	17,623	81,152
	30,000	33,600	37,632	42,148	47,206	52,870	243,456
COST OF SALES							
Food & Drinks	8,000	8,960	10,035	11,239	12,588	14,099	64,922
Newspapers & Magazines	7,000	7,840	8,781	9,834	11,015	12,336	56,806
	15,000	16,800	18,816	21,074	23,603	26,435	121,728
GROSS PROFIT							
Food & Drinks	12,000	13,440	15,053	16,859	18,882	21,148	97,382
Newspapers & Magazines	3,000	3,360	3,763	4,215	4,721	5,287	24,346
	15,000	16,800	18,816	21,074	23,603	26,435	121,728
OTHER EXPENSES							
Lease of Premises	6,000	6,500	7,000	7,500	8,000	8,500	43,500
General	500	550	605	666	732	805	3,858
Electricity & Gas (Fixed)	900	990	1,089	1,198	1,318	1,449	6,944
Electricity & Gas (Variable)	90	101	113	126	142	159	730
	7,490	8,141	8,807	9,490	10,191	10,913	55,032
NET PROFIT	7,510	8,659	10,009	11,584	13,411	15,522	66,696

THEN, compare to best case scenario, and worst case scenario

Base case

DATA SECTION			
	Annual Data		Product cost as a %
	Year 1	Yearly growth	
Revenues	Value	growth	of sales
Food & Drink sales	\$20,000	12.00%	40.00%
Newspaper & Magazine sales	\$10,000	12.00%	70.00%
Expenses	Value	growth	
Lease of Premises	\$6,000	\$500	
General Expenses	\$500	10.00%	
Gas & Electricity (Fixed)	\$900	10.00%	
Gas & Electricity (Variable)	0.30% of sales		

Best case

DATA SECTION			
	Annual Data		Product cost as a %
	Year 1	Yearly growth	
Revenues	Value	growth	of sales
Food & Drink sales	\$20,000	14.00%	40.00%
Newspaper & Magazine :	\$10,000	13.50%	70.00%
Expenses	Value	growth	
Lease of Premises	\$6,000	\$450	
General Expenses	\$500	8.00%	
Gas & Electricity (Fixed)	\$900	8.00%	
Gas & Electricity (Variable)	0.30% of sales		

Worst case

DATA SECTION			
	Annual Data		Product cost as a %
	Year 1	Yearly growth	
Revenues	Value	growth	of sales
Food & Drink sales	\$20,000	6.00%	40.00%
Newspaper & Magazine s:	\$10,000	4.00%	70.00%
Expenses	Value	growth	
Lease of Premises	\$6,000	\$600	
General Expenses	\$500	12.00%	
Gas & Electricity (Fixed)	\$900	12.00%	
Gas & Electricity (Variable)	0.35% of sales		

Use excel function

What if analysis → scenario name 'best case', highlight change cells

Scenario Summary				
	Current Values:	Base	Best	Worst
Changing Cells:				
Food_and_drink_growth	6.00%	12.00%	14.00%	6.00%
Newspaper_sales_growth	4.00%	12.00%	13.50%	4.00%
Lease_increase	\$600	\$500	\$450	\$600
HGeneral_exp_growth	12.00%	10.00%	8.00%	12.00%
Gas_fixed_exp_growth	12.00%	10.00%	8.00%	12.00%
Gas_variable_expense_percent	0.35%	0.30%	0.30%	0.35%
Result Cells:				
Total_sales	205,836	243,456	254,995	205,836
Total_COGS	102,233	121,728	127,283	102,233
Total_gross_profit	103,603	121,728	127,712	103,603
Total_other_expense	57,082	55,032	53,785	57,082
Total_net_profit	46,521	66,696	73,926	46,521

What if (sensitivity) analysis

Data sensitivity tool

- One variable data tables
- Two variable data tables

What is sensitivity analysis

Examines how sensitive the results of an analysis are to changes in the assumptions

- I.e. analyses how outputs vary with changes in one or more inputs to determine which inputs have the greatest impact on results ('critical' parameters)
- May vary a parameter, a decision variable, or the model structure
- May be used as part of debugging process

- If output is unexpected we have uncovered either a bug or an insight

Small changes in input may cause in large changes in results HIGH SENSITIVITY

Large changes in inputs may produce little change LOW SENSITIVITY

Varying inputs or processes

Inputs

- Ask what if the given information were different:
- Tests numerical assumptions of model by varying inputs
- E.g. how much will IRR change if our increase in first year cash receipts turn out to be 10% higher or lower than we have assumed?

Processes

- Vary algorithm to simulate different processes
- E.g. how much will IRR change if we use the 'reducing balance' method of depreciation, instead of 'straight line' method?

One way data table

- Say we have a complicated series of calculations leading to a decision variable
- We might want to see how variation in an input affects output
- Use data table command to summarise outcomes
 - o E.g. we might want to see how a change in the rate of growth of an expense affects NP

OTHER EXPENSES	Year						TOTAL
	1	2	3	4	5	6	
Lease of Premises	6,000	6,600	7,200	7,800	8,400	9,000	45,000
General	500	560	627	702	787	881	4,058
Electricity & Gas (Fixed)	900	1,008	1,129	1,264	1,416	1,586	7,304
Electricity & Gas (Variable)	105	111	117	123	129	136	720
	7,505	8,279	9,073	9,890	10,732	11,604	57,082
NET PROFIT	7,495	7,561	7,655	7,777	7,927	8,105	46,521

Data table command

1. Define input values in a column
 - Represents values that will be used for a given variable (e.g. growth in general expenses)
 - Does not have to be a linear sequence

2. At the top of the next column put a reference to the output cell

3. Run Data table (under Data -> what-if)

- For a one-input, leave row input blank
- Column input is asking "which variable do you want to change?"

Percent growth	General Expenses
10.0%	\$46,721
10.5%	\$46,672
11.0%	\$46,622
11.5%	\$46,572
12.0%	\$46,521
12.5%	\$46,470
13.0%	\$46,417
13.5%	\$46,364
14.0%	\$46,311

Data Table ? ×

Row input cell: 

Column input cell: 

Expenditure Cycle

This is where we order, receive, and pay for stock, consumables, services, and capital equipment

Introduction

A set of exchange transactions contracts between the firm and its suppliers associated with:

- Ordering goods and services from suppliers
- Receiving and storing goods
- Paying suppliers

The primary objective of the expenditure cycle is to acquire and maintain inventory, supplies, and services of the required quality at the lowest cost.

Links to other cycles

Main flow Order → goods / services → invoice → payment

- Expenditure and production cycles
 - o Receive information about sales transactions so they'll know when to initiate the purchase or production or more inventory
- The HR / payroll cycle
 - o Uses information about sales to calculate commissions and bonuses
- The general ledger and reporting function
 - o Uses information produced by the revenue cycle in preparing financial statements and performance results

Expenditure Cycle Business Activities

Three main business activities are performed:

1. Ordering goods and services
2. Receiving and storing goods and services
3. Paying suppliers

Basic functions performed in each activity:

Capturing all required data

Validating proposed activities for that stage of the transaction

Executing the activity

Recording the activity

Ordering Goods and Services:

Key decisions:

- What to purchase
- How much to pay
- When and how much to purchase
- Who we will purchase from

- Who should approve the purchase?

Support System

- Just in time or Materials Requirements Planning
- Economic order quantity model
- Vendor management system

The Order Process:

- Purchase requisition sent to Purchasing department (PD).
- PD raises purchase order (legal contract).
- Relationship between purchase req. and purchase order depends on business rules, but is typically 1:1

Order Controls:

Threat: controls

- Ordering items not needed: edit checks on order (accuracy and completeness checks), review and approval, perpetual inventory system
- Purchase at inflated prices: price lists, competitive bidding, job rotation in purchase function, separate supplier selection and authorisation duties
- Poor quality: approved supplier list, monitor rejection / return rate, collect supplier performance data and evaluate regularly
- Right amount and right time: use established methods to determine order point

Efficiency measures

Aggregate purchase requisitions

- administration (handling and approval) cost driven by no. of purchase orders processed
- Combine requisitions for a vendor to:
 - o Reduce number of PO documents (less approval, receiving, and payment capacity)
 - o Obtain volume discounts

Automatic transactions

- Use EDI to transmit purchase orders
 - o Compute to computer re order when inventory reaches pre-determined level
- Use vendor-managed inventory system
 - o Vendor monitors inventory levels to ensure stock within pre-arranged levels
 - o Contract renewal dependent on performance

Use a reverse auction

- vendors provide tender to online system
- Select best quality at lowest price (often used by supermarkets to purchase fresh produce)

Receiving and Storing Goods

The receiving department accepts deliveries from suppliers.

- Normally, reports to warehouse manager, who reports to Director of Manufacturing

Inventory stores typically stores goods.

- Also reports to warehouse manager

Receipt of goods must be communicated to inventory control function to update inventory records.

Receiving Controls

Threats: controls

- Accept unordered items: require approved purchase order
- Wrong quality: inspection and receiving report, require employees to sign report, bar codes
- Wrong quantity: inspection and receiving report
- Theft: restrict physical access to inventory, document all transfers to employees, periodic stocktake
- Services not performed: sign off against work order, separate inspection and authorisation duties

Paying for Goods and Services

Two main processes involved in paying:

- Approval of vendor invoices
- Payment of invoices/ disbursement of cash.

Approval of vendor by accounts payable (reports to financial controller)

Approval of payment by treasurer, cashier performs payment

Note the separation of duties.

Payment Controls

Threat:

- Failure to take advantage of discounts: file invoices by due date, cash management system
- Paying for items not ordered or not received: match documentation from ordering and receiving steps, require receipts for employee expenses, use of corporate cards
- Duplicate payments: complete voucher package for all invoice payments
- Theft of funds: surprise audits, rotation of duties, enforced holidays, physical security of cheques, access controls to EFT programs, multiple authorisers required for large amounts, conduct regular reconciliation of all bank accounts, separation of payment from authorisation and reconcile duties
- Insufficient funds: cash flow budget

Two invoice processing methods

Voucher

Payment voucher is created when a supplier invoice is approved for payment.

- Identifies the supplier,
- lists outstanding invoices, and
- Indicates net amount to be paid after deducting any applicable discounts and allowances.

In a voucher system, every action is authorised by a document

Non-Voucher:

Non-voucher means no special form is created to process the payment.

Invoice used as payment documentation.

Each approved invoice posted to individual supplier records in the accounts payable file and then stored in an open-invoice file.

When a cheque is written to pay for an invoice, the voucher package is removed from the open-invoice file, the invoice is marked paid, and then the voucher package is stored in the paid-invoice file.

Methods to improve payment efficiency

Invoiceless transactions

- pre-arrange prices
- pay when goods are received (match purchase order with delivery)

Electronic documents

- suppliers submit invoices by EDI
- System automatically matches invoices to POs and receiving reports

Computer managed EFT

- take advantage of early payment discounts

Expenditure Cycle Information Needs

Operational information:

- Determine when and how much additional inventory to order
- Select the appropriate suppliers from whom to order
- Verify the accuracy of vendor invoices
- Decide if purchase discounts should be taken
- Monitor cash flow needs to pay outstanding obligations

Strategic and performance evaluation information:

- Efficiency and effectiveness of the purchasing department
- Analyses of supplier performance such as on-time delivery and quality
- Time taken to move goods from the receiving dock into production
- Percentage of purchase discounts taken

Cost management in excel

Forecasting

Compounding vs. non compounding escalation methods

FV(function)

Fixed vs. variable methods

FVSCHEDULE(function)

Conditional calculations

E.g. when we are forecasting salaries, there are often factors which will effect our result, such as employees who start late, finish during estimated period etc.

Conditional logic basics

Can set up comparisons in spreadsheets

- Use mathematical comparison operators to compare two values
 - o =, >, >=, <, <=, <> (not equal to)
- Result is TRUE (value = 1), or FALSE (value = 0)
 - o E.g. =B2<100
 - o Value is TRUE is B2 is less than 100, otherwise FALSE

Boolean functions: AND

- This is used to test two propositions
- Both must be true for the result to be true
- Eg. Is number in cell B2 between 0 and 100
- Excel formula
 - o =AND(B2<=100,B2>=0)

Boolean functions: OR

- This is also used to test two functions
- Either one or both must be true for the result to be true
- E.g. is number in cell B2 not between 0 and 100
 - o Out o range if number is <=0, OR >=100
 - o Excel formula
 - =OR(B2<=0,B2>=100)
 - o If we reverse result using NOT, formula is equivalent to previous AND
 - o Ie. = NOT(OR(B2<=0, B2>=100)) $\equiv$ AND(B2>=0, B2<=100)

IF Function

- Allows you to test a condition
 - o One value is returned if the condition is TRUE
 - o Another value is returned if the condition is FALSE
 - IF(logic test, value-if-true,value-if-false)
- First argument:
 - o An equation that must be either TRUE or FALSE
- Second argument:
 - o Value excel returns if statement is TRUE
- Third argument:
 - o Value excel returns if statement is FALSE
- All arguments can contain cell references, formulas, and functions (called nested functions) – including other IF functions (called nested IFs)
 - o E.g. If(____,____,if(____,____,if(____,____,____))

E.g. simple IF functions

=IF(D1>26,1,0)

- Checks whether value in D1 is greater than 26
- If so, TRUE, excel returns a value of 1
- If not, FALSE, excel returns a value of 0

= IF(SUM(A1:A3)<100,"OK","Over Budget")

- Checks whether the sum is less than 100
- If so, TRUE, Excel displays OK
- If not, FALSE, Excel displays Over budget
- Note: text must be wrapped in quotation marks

=IF(D1=1, B2/B3, C2*C3)

- If TRUE, Excel divides the number in B2 by the number in B3
- If FALSE, Excel multiplies the number in C2 by the number in C3

E.g. IF function (+AND function)

- This is an example where the IF function contains an AND function as the logic test
- The AND function asks excel to test multiple conditions. If all the conditions are met, Excel returns a value of true. Otherwise excel returns a value of false

- o Question: Students pass a course based on two final exam scores. The first score, stored in cell D5, must exceed 19, and the second score, in cell D6, must exceed 69. Express this functional relationship using IF & AND functions

=IF((AND(D5>19,D6>69)),"PASS","FAIL")

Explanation: The function above reads: If the value in D5 is greater than 19 AND the value in cell D6 is greater than 69, please display the value if true – “PASS”, otherwise display “FAIL”

E.g. IF function (+OR function)

- IF function that contains an OR as the logic test
 - o Question: Students pass a course based on two final exam scores. The first score, stored in cell D5, must exceed 19. Alternatively, the second test score, in cell D6, must exceed 69. Hence at least one of these two conditions needs to be satisfied. Express this functional relationship using IF and OR functions
- =IF((OR(D5>19,D6>69)),"PASS","FAIL")
- o Explanation: The function above reads: if the value in D5 is greater than 19 OR the value in cell D6 is greater than 69, please display the value-if-true, which is “PASS”, otherwise display “FAIL”

Nesting IF functions

- A function within a function
 - o By nesting another IF function inside an IF function, you can test the cell and perform three different actions depending on the outcome of the tests
- Consider a spread sheet that is used to keep track of the rate of commission that a sale team earns
 - o The commission paid should follow the rule outlined in cell A9:B11
 - o Solution in C2:
`IF(B2<=10,$B$9,(IF(B2<=100,$B$10,$B$11)))`
 - o Note: that you do not need to do ALL 3, only smallest to largest, with largest "FALSE" value, so doesn't need its own test
 - o Check week 11/12 tute for more information on this, and assumptions etc.

	A	B	C	D
1	STAFF	SALES	COMMISSIO EARNED	
2	John	\$45		
3	Bill	\$9		
4	Jenny	\$124		
5	Laura	\$78		
6				
7				
8	SALES	COMMISSION		
9	\$1-\$10	10%		
10	\$11-\$100	15%		
11	>\$100	20%		
12				
13				
14				

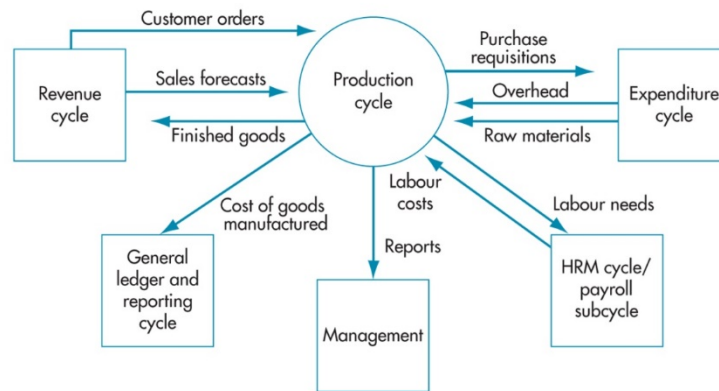
Production Cycle

Production Cycle links to other cycles

Information about production cycle activities flows to other accounting cycles:

- Revenue cycle – sales orders, finished goods for delivery
- HRM cycle/ payroll subcycle – labour time in production
- Expenditure – purchases and other costs
- GLARC – cost of good.
- Production cycle context diagram

FIGURE 10.1
Context diagram of
the production cycle



Production Cycle Activities

1. Product design
2. Planning and scheduling
3. Production operations
4. Cost of accounting

1. Design

Intrinsic quality established during design phase

Design for Manufacturability (DFM)

- Ensure design can be manufactured repeatedly while satisfying the requirements for quality, reliability, performance, availability, and price.
 - o Reduce functional parts
 - o Eliminate nonfunctional parts
- Less costly due to
 - o Simpler design with fewer parts
 - o Simple production processes
 - o Higher quality and reliability
 - o Easier to service

2. Material Planning

Material Planning: What is involved?

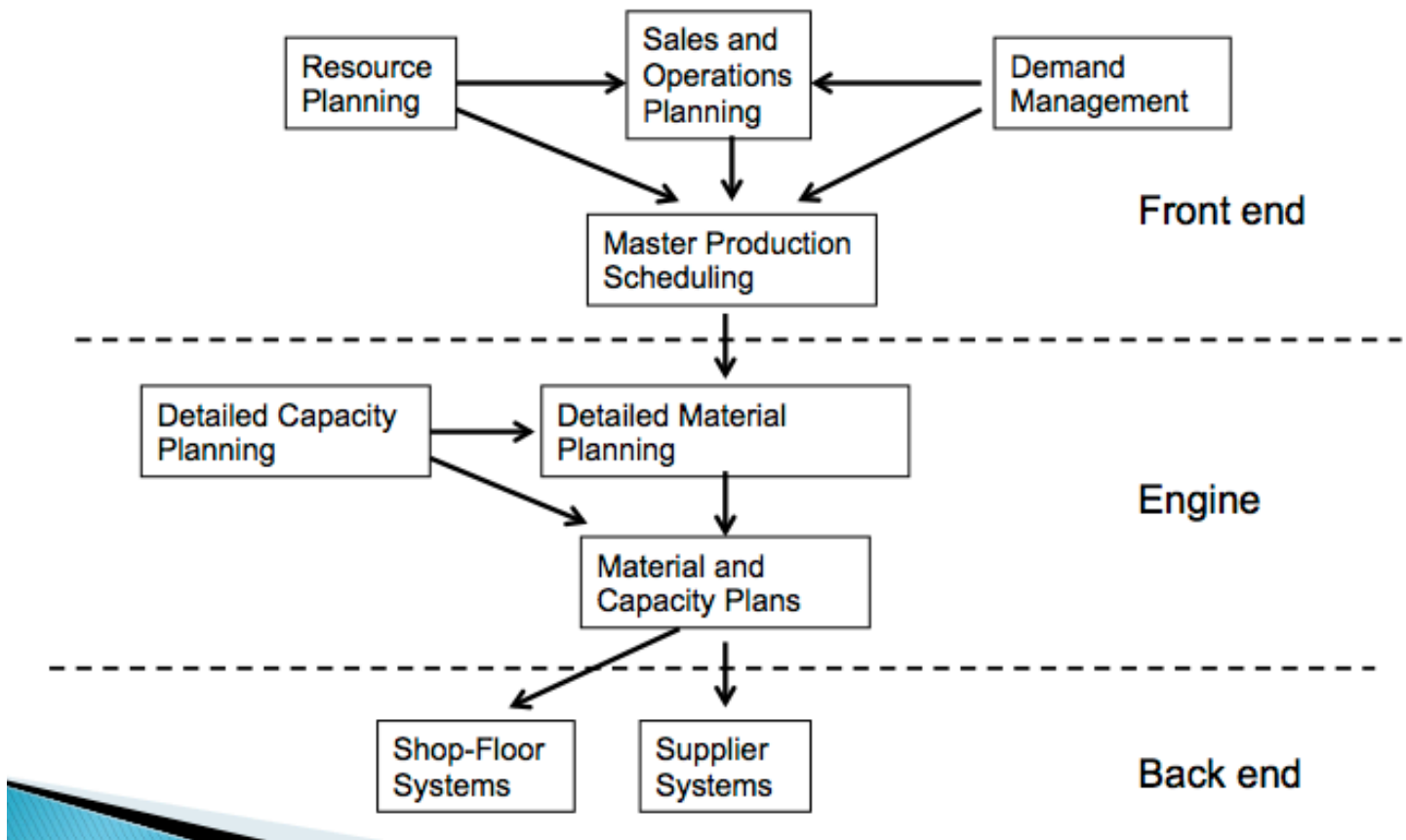
Material planning answers three basic questions:

- What materials are required?
- How many are required?
- When are they required?

Main objective is to balance the demand for materials with the supply of materials

- Demand: fulfillment and production processes
- Supply: procurement and production processes

Other processes -- asset management, project systems, warehouse management -- also affect demand and supply



Front End

- Demand Mgt: forecasting, order entry, coordinates all demands for output
- Sales & ops planning: balances sales/mkt plans with available resources. Company “game plan”
- Resource Planning: resource needs now & future
- MPS: disaggregated version of sales & ops plan

Engine

- Detailed material & capacity planning
- MRP explodes period-by-period plans for all component parts & raw materials
- Compute labor or machine center capacity needs

Back End

- Execution systems
- Who is going to make what, how much, and when
- Machine and operator-level decisions
- Coordination with suppliers
- Suppliers need updating on status, due dates, priorities

Common Production Planning Approaches

- Push manufacturing systems
 - Produce goods in expectation of customer demand, then “push” the goods to the customer
 - Manufacturing Resource Planning often described this way
- Pull manufacturing systems
 - Also called lean manufacturing.
 - Produce goods in response to customer demand (customers “pull” goods from firm)
 - Attempt to eliminate inventory

Materials requirement planning (MRP)

- Derives dependent requirements based on independent requirements
 - In MRP the system calculates the net requirements while considering available warehouse stock + scheduled receipts from purchasing and production
- During MRP all levels of the bill of material (BOM) are planned
 - BOM explosion (i.e. work out which parts are needed and which raw materials are needed to make those parts)
- The output of MRP is a detailed production and/or purchasing plan
- Detailed planning level
 - Primary Functions
 - Monitor inventory stocks
 - Determine material needs
 - Quantity
 - Timing
 - Generate purchase/production orders

Pull Manufacturing

ADVANTAGES	DISADVANTAGES
JIT I.e. pull manufacturing	
Limited and known final inventory	Every job is a ‘high stress’ rush order
Workers only consume their time and raw materials on what is actually needed	Balanced systems must be in place
Quality must be high, each piece has a definite place to go, else immediate feedback is given	Setup time will greatly impact throughput
	Any problem will lead to unhappy customers (either internally or externally)
MRP I.e. push manufacturing	
Allows managers to manage – that is, plan and control things	Can lead to large inventories
Requires intricate knowledge of production time and product flow	Can generate large quantities of scrap before errors are discovered
Can lead to economies of scale in purchasing and production	Requires diligence to maintain effective production flow

Allows for planning and completion of complex assemblies as sub-components are delivered only be scheduled need	Requires maintenance of large and complex databases
---	---

3. Production Operations

Operational controls

- Adequate and ongoing training
- Timing of all production activities
- Access controls

4. Cost Accounting

Use cost accounting techniques to monitor

- Material usage
- Direct labour
- Machinery usage
- Overhead
- Scrap
- Throughput

Use activity-based costing to

Allocate costs to products and departments on basis of activities performed

Reveal true cost of a department or product

Input and Output controls in Excel

Input and output controls

- A well designed program ensures data input is valid, and highlights key output
 - o Informs user how to input data
 - o Restricts input to valid entries where feasible
 - Data-type, data format, value range controls
 - Allow for trade-off between speed and accuracy (e.g. menu-based input is slower than free-form)
 - o Highlights input errors at or close to point of error
 - o Highlights exception conditions or critical issues

Input controls/output controls

Input controls attempt to ensure the validity, accuracy and completeness of the data entered into an AIS

- Data observation
 - o Look for exceptions
- Edit tests
 - o E.g. match purchase order and invoice

- Additional input controls
 - o Control totals

Major types of input controls

- Inform user how to input data
 - o Label field clearly and indicate required format
 - o E.g. 'start date on employment contract yyyyymmdd'
- Edit checks
 - o Lookup value in database (validity) and
 - o Confirm with data entry person
- Highlight invalid data or exception values
 - o Custom format
 - o Conditional formatting
- Restrict input to specific values
 - o Data validation tool
- Access controls
 - o Dealt with in security lectures

Keeping users informed

Providing input support

- Passive information
 - o Headings
 - o Colour
 - o In cell comments
 - o Input messages when cell is selected (part of data validation)
- Active information: highlight invalid data
 - o Custom formatting (detective control)
 - o Conditional formatting (detective control)
- Active information: restrict data input
 - o Data validation rule (preventative control)
 - o Data validation error alert (corrective rule)

Custom formatting

Use custom format pattern to highlight errors

- Only works for numeric input
- Can only distinguish between positive, negative and zero inputs

Custom format

- has up to 4 selections, each separated with a semi-colon
 - o format for positive number; negative number, zero value; text input
 - o E.g. 0;-0;"-" shows a minus sign before number if negative, and a dash for zero
- Can specify colours by naming a colour in square brackets E.g. [Red]
- 0 = always display a digit (e.g. 000 = always 3 digits)
- # = display a digit if present

, = display comma

"text" = display text inside inverted commas instead of number

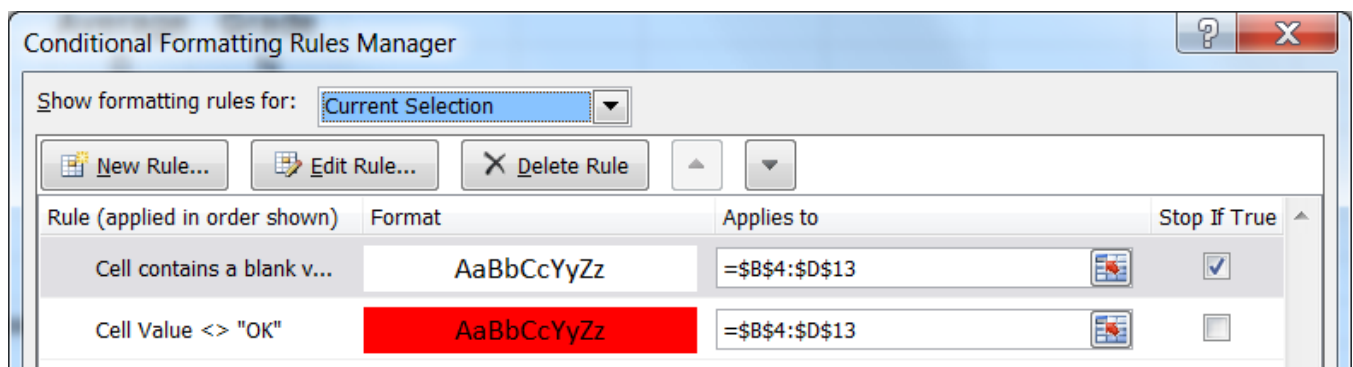
e.g. ##;[Red]"error";[Blue]"absent"

In excel

- Assign format to cell based on value
- Can test for:
 - o Blanks
 - o Specific values
 - o Specific character within test (i.e. substrings)
 - o Range of values
 - o Duplicate values
- Can highlight using
 - o Number format (general, currency etc.)
 - o Font colour, weight (bold, italics), size, typeface
 - o Cell border
 - o Fill colour, pattern, or image (e.g. red background)
- Can have separate format for different types of errors

E.g. want to restrict homework indicator to blank or OK

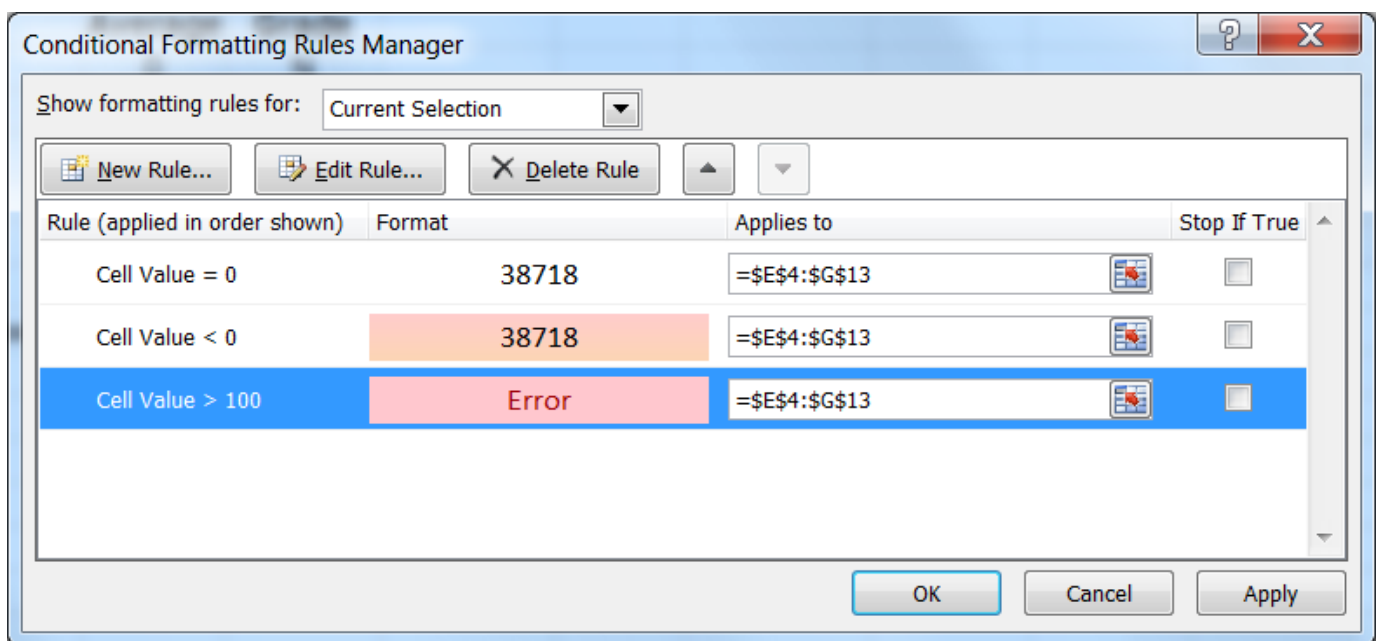
- Use conditional formatting wizard to define two formats
 - o Format I: white background for blank cell (and stop testing unput)
 - o Format II: red background for any text entered except "OK"
 - o Any value except OK or blank will produce a red cell



Conditional formatting e.g. 2

Can have more a more comprehensive scheme using multiple rules

- Default format
- Format for 0
- Format for <100
- Format for >100



=0 Custom format ##;[Red]"error";[Blue]"absent"

<0 Custom format ##;[Red]"error";[Blue]"absent"

>0 Custom format [Red][>100]"Error";

Restricting values: data validation tool

Can generate error message for out-of-range input (e.g. <>"OK")

Note: formula here needs to specify what is invalid, not what is valid

Restrict input to specific values

- Either list values in *source* field (not preferred), or
- Refer to a list of values on the spreadsheet (invisible, maintainable)

Internal controls for system reliability

Internal control

An internal control system consists of various methods and measures (policies, plans, procedures) designed into and implemented within an organisational system to achieve the following objectives:

- Safeguarding assets
- Checking accuracy and reliability of accounting data
- Promoting operational efficiency
- Encouraging adherence to prescribed managerial policies

Control hierarchy

3 main classifications:

- Enterprise level controls: the control environment which affects the entire organisation, including other IT controls, sets the tone at the top, e.g management's ethical values, philosophy, operating style etc.
- General controls for IT: pervasive controls that involve the entire AIS and apply to many processes
- Application controls: business process controls, which are designed to protect transaction processing (completeness and accuracy), and can be programmed into individual modules and applications within the AIS

Security / systems reliability

Foundations of trust services framework:

1. Security is a management issue not a technology issue
2. Defence in depth and the time based model of information security have multiple layers of control

Management's rule on Information Security System IS

- Create security awareness culture
- Inventory and value company information resources
- Assess risk, select risk response
- Develop and communicate security plans, policies and procedures
- Acquire and deploy IT security resources
- Monitor and evaluate effectiveness

Defence in depth and Time Based Model

- Use a combination of preventative, detective and corrective controls
- The goal of a time based model of security is to employ a combination of controls to identify an information security incident early enough to prevent a loss or compromise of information
- If the time it takes an attacker to break through preventative controls **TAKES LONGER** than time to detect attack and to respond to attack – then the **security procedures are effective**

Mitigating risk of attack

- Preventative: training, user access controls (authentication and authorization), network access controls (firewalls, intrusion prevention systems etc.), device and software hardening controls (configure options)
 - o User access controls (authentication and authorization)
 - Authentication: verifies a person by password, smartcard, ID, fingerprint etc.
 - Authorization: determines what people can access data; no access, read only, create/delete/update etc.
 - o Physical access controls (locks, guards etc.)
 - One regular entry point in building (fire doors locked from outside etc.)
 - Receptionist /security guard at entrance and visitor signed in and escorted by employee
 - Rooms housing computer equipment locked and monitored
 - Multiple failed access attempts should trigger alarm
 - Access to wiring must be restricted to avoid wiretapping

- Mobile devices locked (down/away) and data encrypted
- Network access controls (routers, firewalls, intrusion prevention systems etc.)
 - Elements of a network: intranet, extranet, twisted pair, wireless, LAN, WAN
 - Border router: connects organisation's information system to internet
 - Firewall: software or hardware used to filter information
 - Demilitarized zone: separate network that permits controlled access from the internet to selected resources
 - TCP/IP and routers: transmission control protocol, internet protocol, routers, controlling access by filtering packets
 - Intrusion prevention systems: monitors patterns in traffic flow, rather than only inspecting individual packets, to identify and automatically block attacks
 - Securing dial up connections: remote authentication dial-up user service, securing wireless connections
- Device and software hardening controls (configuration options)
 - End point configuration: disable unnecessary features that may be vulnerable to attack on servers, printers, workstations, regularly update antivirus and firewall software at endpoints
 - User account management: particularly for systems 'admin' staff (use two accounts, including a limited privileges account for browsing and emailing etc.)
 - Software design: programmers must be trained to treat all input from external users as untrustworthy and to carefully check it before performing further functions
- Detective controls: log analysis, intrusion detection systems, security testing and audits, managerial reports
 - Log analysis: process of examining logs to identify evidence of possible attacks
 - Intrusion detection: sensors and a central monitoring unit that create logs of network traffic that was permitted to pass the firewall and then analyse those logs for signs of attempted or successful intrusions
 - Managerial reports
 - Security training
- Corrective controls : computer incident response teams, chief information security officer, patch management
 - Computer incident response team: recognize that a problem exists, containment of the problem, recovery, follow up
 - Chief Information security officer: independent responsibility for information security assigned to someone at an appropriate level of senior management
 - Patch management: to fix known vulnerabilities by installing the latest updates for security programs, operating systems, and applications programs

Steps in security intellectual property (IP)

Identification and classification

Where is the information, who has access to it?

Classify valuable information

Encryption

The process of obscuring information to make it unreadable without special knowledge, key files, or passwords

- Preventative control
- Process of transforming normal content, called plaintext, into unreadable gibberish
- Decryption reverses this process

Encryption strength

- Key length – number of bits (characters) used to convert into blocks (usually 256)
- Algorithm – manner in which key and text is combined to create scrambled text
- Policies for managing encryption keys – stored securely with strong access codes, key escrow

Controlling access to sensitive information

- Information rights management IRM: software provides an additional layer of protection to specific information resources, offering the capability not only to limit access to specific files or documents, but also specific actions (read, copy, print, download etc.) that individuals who are granted access to that resource can perform
- Preventing physical access: to prevent downloading to external data storage units
- Disposal of information: needs to be addressed
- Virtualisation and cloud computing also affect the risk of unauthorized access to sensitive or confidential data
 - o Highly sensitive and confidential data should not be stored in a public cloud
 - o All communication between users and a cloud must be encrypted
 - o Corporations using cloud should be sure their contractual obligations protect their rights to their data

Training

Training is an extremely important control for protecting confidentiality

Employees need to know:

- What data / information they can share with outsiders and what needs to be protected ?
- How to protect confidential data

Training should include:

- Logging out before leaving computer unattended
- Coding reports to reflect the importance of its contents
- Not to leave reports containing sensitive information in plain view on their desks when they leave
- The proper use of email, instant messaging (chat) and social media

Excel – optimization (break even point)

Break even point

This is a type of what if analysis that calculates activity needed to reach break even point for a product

Procedure works backwards from desired outcome (goal)

- Determines the changes needed in input variables to achieve that goal
- Performs interactive recalculations that continue until
 - o The model finds satisfactory values for the input variables, or
 - o Exceeds the limit on the number of iterations
- Excel limitations
 - o Allows you to vary only a single output
 - o Input must be a constant value, not a value derived from a formula

Linear programming

This finds the most optimal or most efficient, way of using limited resources to achieve the objectives of an individual of a business – i.e. **optimization**

Protecting spreadsheets

Control framework for protecting assets

- Backup
- Prevent unauthorized logical access
 - o To file
 - o To a sheet
 - o To specific cells
- Detect unauthorized updates
 - o Validation of file

Backup procedures

- Quality of controls: primitive
- How it works
 - o Auto-back up for quick recovery
 - o Automatic sync with network files when network is not available

Setting permissions

- Read only
- Add password
- Prevent specific types of changes
- Prevent specific actions (e.g. copy or print, or download)
- Allow only specific people to make changes
- Add digital signature to verify authenticity

Restrict / prevent logical access to entire file

- Provides password based control over access and or modification

Password controls

- Most non-expert users will not be able to access without a password
- But actually easy to break
 - o Free utilities can break simply (8 character) passwords
 - o \$20 utilities can break longer passwords
- Conclusion: only use for basic access control

Control access to certain sheet

- Right click on tab name, select protect, can control whether cells can be changes, inserted, deleted etc.

Hiding a sheet

- If you have a sheet that contains sensitive data you can hide entire sheet, right click → hide
- Then protect workbook so that the sheet cannot be views

Detecting unauthorized updates

- Checksum
 - o Has total for file, changes in any way, total also changes
 - o Many tools available to computer and or check
- Digital signature
 - o Verification algorithm (e.g. checksum) with result secured via asymmetric cryptography
 - o Gives receiver reason to believe the file was produced by the claimed producer
 - o Also provides non-repudiation, meaning that the signer cannot successfully claim that they did not sign a message

Checking the originality of a document

- An electronically stored or transmitted document might have been tampered with
- Authentication is the process of proving that a document is what it claims to be
- It protects against the fraudulent alteration of a document by the use of digital signatures
 - o Digital signature is a calculated number based on the contents of a document
 - o Digital signatures are useful for ensuring that data has not been tampered with
 - o Can use for safeguarding resources:
 - Sensitive information
 - Electronic currency

Transaction cycles: threats and control procedures

Overview of control objectives

Controls can be directed at managing operational activities, or controlling information processing

Operations (general controls)

- Effectiveness of activity (how well is it done?)
- Efficiency (how efficiently are resources used?)
- Security of resources (data, assets)

Information processing (application controls)

- Input validity (is it the right sort of data?)
- Input correctness (is it enough)
- Input accuracy (is it correct)
- Update completeness (e.g. has all data in batch been processed?)
- Update accuracy (is the output correct for the input provided?)

Separation of duties

This is critical for controlling operations and information processing

- Custody: handling cash, inventory, tools, trade samples, other valuable assets
- Recording: data entry, prepare source documents (e.g. purchase order, journal entry slip)
- Reconcile: prepare cash payable, receivable reconciliations, prepare performance reports
- Authorisation: approve transactions

Note: if there are only 3 employees available – combine recording and reconciliation

Need for separation

Recording from reconciling

- Also prevents falsification of records

Custodial from recording

- Prevents falsification of records

Custody from authorization

- Prevents authorization of fictitious transactions

Recording from authorization

- Prevents covering up false transaction

Making adverse events less likely

Implement physical controls

- Avoid flood by choosing high location
- Make user choose from a list instead of entry in a text box

Implement 'parameter comparison controls'

- Pick a desired system state
- Then choose actions that can help to achieve that state (reduce probability of an adverse event occurring)
- It matters when (temporal) and where (spatial) a control is applied

E.g. activities for access control to be effective

- An authorization activity
- A standard for an authorized user (e.g. holds a valid access card)
- A comparison function which enables one to compare those people wishing access to organisation

- An abort function where illegal entry is detected
- A review function to follow up illegal access attempts

Organisation – hierarchy of controls

Organisations require a hierarchy of controls

- Lower level employees report to supervisor
- Supervisors to managers
- Managers to executives
- Executives oversee each other, also report to shareholders

At least one element of lower order controls has to be present in the next level of control

Many normal management functions fit concept of a control

- Budget is a form of 'feed forward' control
- Salary bonus, usually based on budget vs. actual, are a form of feedback control

General revenue cycle threats: controls

- Inaccurate or invalid master data
- Unauthorised disclosure of sensitive information
- Loss or destruction of master data
- Poor performance

Controls: encryption, access controls, managerial reports, independent authorisation, data processing integrity controls, review of all changes to master data etc.

Sales order entry basic threats

- Data missing or inaccurate: ineffective and threat to reputation
- Invalid order: non-existent customer or invalid order (e.g. cancelled but delivered), threats to resources
- Non-payment of account: threat to resources
- Inventory not available/excess inventory: excess inventory is inefficient use of physical assets, threat to resources (excess inventory is dead money, all that shit from management accounting, obsolescence etc.)

Controls: training, credit limits, data entry edit controls, digital or written signatures, aging of accounts receivable, restriction of access to master data, use of bar-codes or RFID, perpetual inventory system, sales forecast, periodic physical counts of inventory

Shipping threats

- Who: deliver to wrong address or wrong customer
- What: picking wrong item or wrong quantity
- When: incorrect shipping time
- Result: effectiveness (performing picking activity badly), efficiency (rework required), security (items may not be recoverable and probably still need to ship correct goods)
- Theft of inventory (security)

Controls: bar-code, technology to identify when items picked or packed, data entry via bar code scanners and RFID, configuration of ERP systems to prevent duplicate shipments, reconciliation of picking lists to sales order details, of shipping documents with sales orders, restriction of physical access to inventory, documentation of all inventory transfers, periodic physical counts of inventory and reconciliation to recorded quantities

Production threats

Design: is it the right product? Is it safe? Too many unique components? Is customization as late as possible in process? How secure is design? How trustworthy and secure are our partners?

Planning: is production quantity stable, are changes authorized? What if a supplier fails?

Operations: are raw materials secure? Is facility secure? How are costs allocated? How is performance measured?

Excel – looking up data in excel

E.g. what if we want to lookup the category an item belongs to?

E.g. product codes 101, 203, 553 are all 120 volt, everything else is 240 volt.

On excel:

=IF(B2=(101,203,553),120,240)

If B2 is one of those values, it will equal 120 as this is the TRUE value

If B2 is not one of those values, it will equal 240 as this is FALSE value

However, this is not what we want to do as it involves HARDCODING (e.g. 101,203,553)

There are a number of alternatives we have available to us

CHECK TUTE 12 NOTES

CHOOSE function

E.g. we want to find out the 5th value in the list

=CHOOSE(position number, item 1, item 2... item 5...)

=CHOOSE(5,a,b,c,d,e,f,g,h,i,j,k,l)

And as “e” is the 5th number, it will = ‘e’

VLOOKUP function

=VLOOKUP(value, table, column#, type)

value = search value (in column 1)

table = range reference of the table (highlight the whole table)

column# = column number within the table containing the information to be returned

type = FALSE when an exact match is not required

Returns #N/A if no match

Use ISNA to determine whether a match has been found

*CHECK

MATCH function

This finds the location of a value in a range, returns the position of the value

=MATCH(value to find, range to search, match_type)

Type: 1 = largest value in range <= to lookup

0 = exact match

-1 = smallest value >= to lookup value

INDEX function

Returns the nth value in a range

INDEX(range, row_num)

Symbol	Cardinalities	Example	Meaning
	Minimum = 0; Maximum = 1		Each instance of entity A may or may not be linked to any instances of entity B, but can be linked to at most one instance of entity B.
	Minimum = 1; Maximum = 1		Each instance of entity A must be linked to an instance of entity B, and can only be linked to at most one instance of entity B.
	Minimum = 0; Maximum = many		Each instance of entity A may or may not be linked to any instances of entity B, but could be linked to more than one instance of entity B.
	Minimum = 1; Maximum = many		Each instance of entity A must be linked to at least one instance of entity B, but can be linked to many instances of entity B.

Notes from Chapter 20

- It is estimated that each year corporate America spends over \$300 billion on more than 200,00 software projects.
- Companies change their systems for the following reasons
 1. Changes in user or business needs
 2. Technological changes
 3. Improved business processes
 4. Competitive advantage
 5. Productivity gains
 6. Systems integration
 7. Systems age and need to be replaced
- A study by Standish Group found that 70% of software development projects were late, 54% were over budget, 66% were unsuccessful, and 30% were cancelled before completion. An American Management Systems study revealed that 75% of all large systems are not used, are not used as intended, or generate meaningless reports or inaccurate data.

Topic 1: The Systems Development Life Cycle (SDLC)

SDLC is a five-step process used to design and implement a new system. It consists of:

1. Systems Analysis
 - a. Where the information needed to purchase, develop, or modify a system is gathered
2. Conceptual Design
 - a. Where analysts decide how to meet user needs, identify and evaluate design alternatives, and develop detailed specifications for what the system is to accomplish and how it is to be controlled.
3. Physical Design
 - a. Where broad, user-orientated conceptual design requirements are translated into the detailed specifications used to code and test software, design input /output, create files/databases, develop procedures, and implement controls
4. Implementation and conversion
 - a. Where the company hires and trains employees, test and modifies procedures, establishes standards and controls, completes documentation, moves to the new system, and detects and corrects design deficiencies.
5. Operations and maintenance
 - a. Where the system is periodically reviewed and necessary modifications and improvements are made

People involved:

A number of people must cooperate to successfully develop and implement an AIS:

- Management
- Users
- Information System Steering Committee
 - o An executive level information systems steering committee plans and oversees the information systems function.
 - o Sets AIS policies; ensures top-management participation, guidance and control; and facilitates the coordination and integration of system activities.
- Project Development Team
- System Analysts and Programmers
- External Players

Topic 2: Planning Systems Development:

This section discusses the planning performed through the SDLC

- Planning benefits:

- Enables the system's goals and objectives to correspond to the organisation's overall strategic plan.
- Duplication, wasted effort, and cost and time overruns are avoided.
- The system is less costly and easier to maintain.
- Management is prepared for resource needs, and employees are prepared for the changes that will occur.

Two system development plans are needed:

1. **Project development plan**

Document showing project requirements

Contains:

- Cost-benefit analysis, and
- Developmental and operational requirements (people, hardware, software, and financial), and
- A schedule of the activities required to develop and operate the new application.

- **Master Plan**

Prepared by the information systems steering committee

Specifies:

- What the system will consist of,
- How it will be developed
- Who will develop it
- How needed resources will be acquired
- Where the AIS is headed

Planning techniques:

PERT and Gantt charts are techniques for scheduling and monitoring systems development activities.

- The Program Evaluation and Review Technique (PERT) requires that all activities and the precedent and subsequent relationships among them be identified.
 - Completion time estimates are made, and the **critical path** – the path requiring the greatest amount of time – is determined.
- Gantt is a bar chart used for project planning. It shows project activities on the left, units of time cross the top, and the time each activity is expected to take as a horizontal bar.
 - Primary advantage is the ability to show graphically the entire schedule for a large, complex project, including progress to date and status.
 - Disadvantage is that it does not show the relationship among project activities

Topic 3: Feasibility Analysis

An investigation to determine whether it is practical to develop a new application or system

- Prepared with input from management, accountants, systems personnel, and users
- The further along a development project is, the less likely it is to be cancelled if a proper feasibility study has been prepared and updated.
- Five important aspects to be considered during a feasibility study:
 1. **Economic feasibility:** Will system benefits justify the time, money, and resources required to implement it?
 - a. Organisations use **capital budgeting models:** Return-on-investment techniques used to compare estimated benefits and costs to determine whether a system is cost beneficial.
 - i. Between 65% and 75% of yearly systems-related expenditures are for maintaining current systems
 - b. The three commonly used capital budgeting techniques are:
 - i. **Payback Period:** The payback period is the number of years required for net savings to equal the initial cost of the investment
 - ii. **Net Present Value:** All estimated future cash flows are discounted back to the present, using a discount rate that reflects the time value of money. The initial outlay costs are deducted from the discounted cash flows to obtain the **net present**

value. A positive NPV indicates the alternative is economically feasible. The highest NPV is usually selected.

iii. **Internal Rate of Return (IRR):** Is the effective interest rate that returns in an NPV of zero. A project's IRR is compared with a minimum acceptable rate to determine acceptance or rejection. The proposal with the highest IRR is usually selected.

2. **Technical feasibility:** Can the system be developed and implemented using existing technology?
3. **Legal feasibility:** Does the system comply with all applicable federal and state law, administrative agency regulations, and contractual obligations
4. **Scheduling feasibility:** Can the system be developed and implemented in the time allotted?
5. **Operational feasibility:** Does the organisation have access to people who can design, implement, and operate the proposed system? Will people use the system?

Topic 4: Behavioural Aspects of Change

The positive and negative ways people react to change; managing these behavioural reactions is crucial to successfully implementing a new system

Why behavioural problems occur: (ie. Why resistance takes place)

- **Fear:** People fear the unknown, losing their jobs, losing respect or status, failure, technology and automation, and the uncertainty accompanying change
- **Top-management support:** Employees who sense a lack of top-management support for change wonder why they should endorse it
- **Experience with prior changes:** Employees who had a bad experience with prior changes are more reluctant to cooperate
- **Communication:** Employees are unlikely to support a change unless the reasons behind it are explained
- **Disruptive nature of change:** Requests for information and interviews are distracting and place additional burdens on people, causing negative feelings towards the change that promoted them.
- **Manner in which change is introduced:** Resistance is often a reaction to the methods of instituting change rather than to change itself. The rationale used to sell the system to top management may not be appropriate for lower-level employees. The elimination of menial tasks and the ability to advance and grow are often more important to users than are increasing profits and reducing costs.
- **Biases and emotions:** People with emotional attachments to their duties or co-workers may not want to change if those elements are affected.
- **Personal characteristics and background:** Generally speaking, the younger and more highly educated people are, the more likely they are to accept change. Likewise, the more comfortable people are with technology, the less likely they are to oppose it.

How people resists change:

- Initial resistance is often subtle, manifested by failure to provide developers with information, tardiness, or sub-par performance.

Often takes place in three forms:

1. **Aggression:**
 - a. Resistance to change intended to destroy, cripple, or weaken system effectiveness, such as increased error rates, disruptions, or deliberate sabotage.
2. **Projection:**
 - a. Blaming the new system for everything that goes wrong. This can destroy system integrity.
3. **Avoidance:**
 - a. Where users ignore the new IS in the hope that the new system will eventually go away.

Preventing behavioural problems

The human element, which is often the most significant problem a company encounters in implementing a system, can be improved by observing the following guidelines:

- Obtain management support:

- Meet user needs
- Involve users
- Allay fears, and stress new opportunities
- Avoid emotionalism
- Provide training
- Re-examine performance evaluation
- Keep communication lines open
- Test the system
- Keep the system simple, and humanise it
- Control users' expectations

These guidelines are time-consuming and expensive, and workers may skip them to speed systems development and installation. However, the problems caused by not following the guidelines are usually more expensive and time-consuming to fix than to prevent.

Topic 5 – Systems Analysis

When a new or improved system is needed, a written **request for systems development** is prepared. The request describes the current problem, the reasons for the change, the proposed system's objectives, and its anticipated benefits and costs.

The 5 steps in the analysis phase are:

1. **Initial investigation:**
 - a. To determine whether a proposed new system is both needed and feasible.
 - b. A **proposal to conduct systems analysis** is prepared for all approved projects.
2. **Systems survey:**
 - a. An extensive study of the current AIS that attempts to understand how it works. Includes evaluation strengths and weaknesses, assessments of processing needs, conducting feasibility analysis and making recommendations to management.
 - b. Some data gathering methods include (4):
 - **Interviews**
 - Advantages: can answer 'why questions' and build positive relationships
 - Disadvantages: Time-consuming and expense
 - **Questionnaires**
 - Advantages: Anonymous, not time-consuming, inexpensive.
 - Disadvantages: No depth, cannot follow up, impersonal, often ignored and superficial
 - **Observation**
 - Advantages: Verifies how systems actually work
 - Disadvantages: Time-consuming, expensive, difficult to interpret properly & observed people may alter behaviour.
 - **Systems Documentation**
 - Advantages: Describes how system should work.
 - Disadvantages: Time-consuming and may not be available or easy to find.
- **Physical models** illustrate how a system functions by describing document flow, computer processes performed, the people performing them, and the equipment used.
- **Logical models** focus on essential activities and the flow of information, not on the physical processes of transforming and storing data.

The systems survey culminates with a **systems survey report** which summarises all the activities that took place during the survey.

3. **Feasibility study:**
 - a. Develop a more thorough feasibility analysis, especially with respect to economic costs and benefits. (see previous discussion)
4. **Information needs and systems requirements:**
 - a. 70% of project failures are due to insufficient, inaccurate, or outdate systems requirements.

- b. Error correction costs increase as development proceeds through the SDLC
- c. A systems success often depends on the ability to cope with organisations constraints which include governmental agency requirements, management policies, lack of qualified staff, user capabilities and attitudes, technology, and limited finances.

To determine what a system requires:

1. Ask users what they need
2. Analyse external systems
3. Examine existing systems
4. Create a prototype

5. Systems analysis report:

- a. Comprehensive report summarising systems analysis that documents the finding of analysis activities.
- b. A go/no-go decision is made up to three times during systems analysis
 1. During the initial investigation to determine whether to conduct a systems survey
 2. At the end of the feasibility study to determine whether to proceed to the information requirements phase
 3. At the completion of the analysis phase to decide whether to proceed to conceptual systems design.

EXCEL MULTIPLE CHOICE NOTES

- 2 questions relating to Excel – introduction, financial modelling, accounting dashboard (weeks 1, 2 & 5 excel part of lecture) (regarding concepts and good practices)

Well-designed spreadsheets are:

- **Likely to meet user requirements**
- **Easy to understand**
 - o Users can see how to use
 - o Others can make future changes
- **Reliable**
 - o Tested rigorously
 - o Few “existing” or “potential” errors
- **Flexible**
 - o Modular
 - o Easy to modify
 - o Can be re-used for similar applications
- **Efficient**
 - o Computer resource usage (i.e. use efficient formulas)
 - o User’s time (i.e. designed to suit user, not programmer)

Guidelines

- **Spreadsheet design**
 - o Don’t hard-code
 - o Formulas that perform the same calculation in a row or column **must be consistent**
- **Make your work easy to understand**
 - o Use meaningful report titles, row labels and column headings
 - o Include you **name** and a **date/time stamp** as a footer on reports

Programming guidelines

- **Understand how users will use the software**
 - o Design for other people
 - o Try to make the formulas and structure self-explanatory
 - o Make help available to users when they need it
- **Minimise complexity**

- **Design in layers** (stratification – separating the spreadsheet into tabs or blocks)
 - o Ensures less prone to data entry error
 - o Complexity can be hidden from user
 - o Each tab can have very different settings
 - o Don't need to overwhelm user with detail
 - o Protect proprietary calculations (password protect and make sheet hidden)
 - o Minimise communication between layers (loose coupling)
- **Use industry standard conventions**
- **Have someone else test your work**
 - o Programmers test their own work very gently

How to design a spreadsheet

1. **Design the high-level structure.** Okay, you're not going to know exactly what the layout of the model will be until you dig into it, but you should have some idea of the tabs. Start by assembling the data you have so far into the tabs as shown in Figure 2.5.
2. **Design outputs: summaries, charts, and reports.** Begin with the end in mind. By thinking about the output of your model early on in the process, you'll be more focused and will ensure that all of your calculations work toward the desired end result.
3. **Design inputs.** Thinking about the input design issues, get your input data into the right format or layout so that you can link your calculations to it.
4. **Plan calculations by breaking larger problem into smaller ones.** Now begin your calculations. You might begin by thinking that all expenses can go on one tab, but if staff costs, for example, begin getting rather complicated, you might decide that staff costs needs a tab of its own.
5. **Finalise outputs.** Link through your calculations to the outputs page. Test at every stage to make sure that the model makes sense and adjust as necessary.
6. **Design sensitivities and scenario analysis.** Once the model is working correctly, you can add sensitivities and scenario analysis. See "Overview of Scenarios Analysis Tools and Methods" in Chapter 11 for more detail to help you choose which methods of scenario analysis to use.
7. **Document as you go.** Assumptions documentation should not be left to the end. Do it *as you go!*

Week 5 – dashboards

Digital dashboards:

- A style of reporting that depicts KPIs, operational or strategic information with intuitive and interactive displays

Tello in week 5 lecture said that the following will be a question on the exam most likely:

Data virtualisation:

- HOW TO SHOW THE KEY DATA IN A PRACTICAL WAY IN A WAY THAT CAN BE UNDERSTOOD EASILY AND QUICKLY
- Data visualization harnesses the power of analytics and adds a visual display to capitalize on how our brain works
- Interactive displays, charts with drill-down capability, and geospatial data analysis are a few examples of the many ways to work with data

- With more & more data available to users & the increasingly competitive business landscape, the needs of business users are becoming more complex

Why Important

- To make quick decisions!
- Digital dashboard is a snapshot that is giving you key information to make decisions quickly (HINT WAS HERE)

Dashboard benefits (HINT WAS HERE – HE SAID HE WILL PUT THIS QUESTION IN PRETTY MUCH)

- ✓ Visibility
- ✓ Continuous improvement
- ✓ Single sign on (can be used by anyone in the company)
- ✓ Budget on planning deviations
- ✓ Accountability
 - ✓ Shows performance (green for good, red for bad)

Short Answer Questions

Q1

- Question 1 has 3 sub-questions
- This question is based on Chapter 10 (Processing Integrity & Availability Controls) of Romney and Steinbart (2018) which was covered in **week 6 lecture**.
- **There are 3 sub questions** in relation to “**Availability**” (found on pages 329-334)
 - First sub-question is practical/critical thinking (small scenario)
 - Second sub-question is a critical thinking question
 - Third sub-question is practical/critical thinking
- MAIN TOPICS ARE
 - **DRP Systems**
 - **Business continuity plans**

Notes from pages 329-334

Availability

Interruptions due to unavailability of systems can cause significant losses

Objectives of availability:

1. Minimising risk of system downtime:

- **Preventive maintenance**, such as cleaning disk drives and properly storing magnetic and optical media, to reduce the risk of hardware and software failure.
 - Ongoing check ups to test everything is working
- **Fraud tolerance:** The use of redundant components provides **fault tolerance**, which is the ability of a system to continue functioning in the event that a particular component fails.
 - Many organisations use **redundant arrays of independent drives (RAID)** where data is written to multiple disk drives simultaneously which ensures that if one disk fails, the data can still be readily accessed from another.
 - Ask someone to try and hack your system and see if it works properly
- **Data centre location and design**
 - Minimise risk of natural and human created disasters
 - Say all information is put in the cloud, this will be protected from an earthquake at the headquarters.
- **Training**
 - Less likely to make mistakes **AND** will know how to recover from errors they do commit
- **Patch management and antivirus software**

- It is a strategy for managing patches or upgrades for software applications and technologies.

2. Quick and complete recovery and resumption of normal operations:

It is almost impossible to entirely eliminate system downtime. That is why senior management needs to ask

1. How much data are they willing to recreate from source documents or potentially lose
 - a. Relates to the **Recovery Point Objective (RPO)**: The maximum amount of data the organisation is willing to re-enter or potential lose.
 - i. Inversely related to the frequency of backups: the smaller the desired RPO, the more frequently backups need to be made.
2. How long can the organisation function without its information system?
 - a. Relates to the **Recovery Time Objective (RTO)**: The maximum tolerable time to restore an organisations information system following a disaster, representing the length of time that the organisation is willing to attempt to function without its information system.

- Data Backup Procedures

- Data backup procedures are designed to deal with situations where information is not accessible because the relevant files or databases have become corrupted as a result of hardware failure, software problems, or human error, but the information system itself is still functioning.
 - Full backup: Exact copy of entire database
 - Time-consuming so most organisations will only do weekly ad supplement them with daily partial backups.
 - Types of partial backups include:
 1. An **incremental backup** – Involves copying only the data items that have changed since the last *partial backup* This produces a set of incremental backup files, each containing the results of one day's transactions.
 2. A **differential backup** – Involves copying changes made since the last full backup. Thus, each new differential backup file contains the cumulative effects of all activity since the last full backup.
 - ii. No matter which backup procedure is used, multiple copies should be created. Store both on and offsite in case of floods for example.
 - iii. Security, such as encryption should be applied.
 - iv. Important to verify that the backup procedure is working properly.
- Backups are retained for only short periods of time, however some information will be **archived** – a copy of a database, master file, or software that is retained indefinitely as a historical record, usually to satisfy legal and regulatory requirements.

Disaster Recovery Plan (DRP)

A **documented process or set of procedures** to recover, restore and protect an organisations **IT** infrastructure in the event of a disaster

- 3 options when it comes to replacing their IT infrastructure, could contract for a:
 1. **Cold site:** An empty building that is prewired for necessary telephone and Internet access, plus a contract with one or more vendors to provide all necessary equipment within a specified period of time. – just a physical space
 - a. Does not contain any computing equipment
 - b. If management can tolerate having both RTO and RPO be greater than one day, using a cold site for DRP may be appropriate.
 - c. **Least expensive**
 2. **Hot site:**
 - a. Relies on access to a completely operational alternative data centre that is not only prewired but also contains all necessary hardware and software.
 - b. If management has decided that it can tolerate RTO and RPO ranging from hours up to a full day, the choice of a hot site as a DRP strategy is warranted.
- Organisations can choose whether to build their own hot site or cold site, or they can contract with a third party for use of such facilities.
 - TP: In the event of major calamity that has the ability to affect every organisation in a geographic region, some organisations may not be able to use the services for which they contracted.
- 3. **Real-time mirroring:**
 - a. Maintaining complete copies of a database at two separate data centres and updating both copies in real-time as each transaction occurs.
READY TO GO
 - b. RPO and RTO are close to zero.
 - i. Such as airlines
 - c. **Most expensive**
- Cost should not reflect management's decision; it should be driven by the **RPO and RTO**.

Difference between BCP and DCP - is that BCP looks at the business as a whole while DCP is on IT

- **Business Continuity Plan (BCP)** – about not only IT but all business processes
 - A plan that specifies how to resume not only IT operations but all business processes in the event of a major calamity.
 - Includes relocating to new offices and hiring temporary replacements
 - More than half of the organisations without a DRP and a BCP never reopen after being forced to close down for more than a few days because of a disaster.
- Both plans must be well document
 - This includes documenting the numerous **modifications made to default configurations**, so that the replacement system has the same functionality as the original.
 - Failure to do so can create **substantial costs and delays** in implementing the recovery process.

- Detail operating instructions also needed, especially if temporary replacements have to be hired.
- This documentation needs to be stored both on and off site.
- Periodic testing and revision are probably the most important components of effective DRPs and BCPs.
 - Tested on at least an annual basis to ensure that they accurately reflect recent changes in equipment and procedures.
 - It is especially important to test the procedures involved in the transfer of actual operations to cold or hot sites.
 - After the tests, the plans and procedures need to be updated.
- **Effects of virtualisation and cloud computing**
 - A virtual machine is just a collection of software files.
 - Virtualisation significantly reduces the time needed to recover (RTO) from hardware problems.
 - Virtualisation does not eliminate the need for backups.
 - Cloud computing has both positive and negative effects on availability:
 - Data is kept in multiple places, reducing system downtime and the loss of all data
 - However, if the cloud provider goes out of business it may be difficult to retrieve that data.
 - Therefore, a policy of making regular backups and store those backups somewhere other than with the cloud provider is critical.
 - In addition, accountants need to assess the long-run financial viability of a cloud provider before their organisation commits to outsource any of its data or applications to a public cloud.

Short Answer Question 2

- The main reference for these 2 sub-questions is **chapter 3 (Systems Documentation Techniques)** of Romney and Steinbart (2018) – week 7
- Bear in mind that we have reviewed documentation techniques in different topics as well. For example, Weeks 8,9, and 10 (Revenue, Expenditure and Production Cycle)
- Tello said to look at the tutorial – wall parts – one of the questions was similar to the final exam last year – level 0
- 2 subquestions
 - One of the questions is a critical thinking question and the other question is more practical
 - You don't need to practice how to draw a flowchart, but you need to understand how to read flowcharts and DFDs
 - **First sub-question:** You need to practice how to draw a DFD (Context AND Level 0) AND you also need to be clear about the elements of DFDs and practice how to write a narrative (if you are given a DFD)
 - Narrative is easy – just need to describe the figure of how data flows.
 - **Second sub-question:** You need to understand the importance of documentation techniques in general and also the importance of DFDs, Flowcharts & Business Process Diagrams; pros and cons of each.
 - Understand the importance of documentation. What are the benefits of using DFDs and those things.

Notes chapter 3

System documentation is a way of visually depicting the operations of a system.

- It explains how a system works and includes diagrams, flowcharts, tables and other written materials that explain how a system works. These are supplemented by a **narrative description** of the system, a written step-by-step explanation of system components and interactions.
 - Documentation tools are used extensively by auditors to report on the internal control of a company .

- The emphasis is being able to **depict the systems & their interactions across the business process, with an emphasis on being aware of data flows & how the data moves through a business.**

Accounts

- Must be able to read documentation and understand how a system works
- Be able to follow an audit trail
- Have auditing responsibilities (able to assess risk)

Documentation explains:

- What is there (i.e. has what is called an **ontological purpose**)
- Describes who, what, when, where and how of systems
 - Input, process, storage, output, and controls

Importance of documentation techniques for the following levels:

1. Need to be able to **read** documentation to determine how a system works
2. You may need to **evaluate** documentation to identify internal controls strengths and weaknesses and recommend improvements as well as to determine if a proposed system meets the company's needs.
3. More skill is needed to **prepare** documentation that shows how an existing or proposed system works
 - **Blair and Boyce (2006) note 7 reasons why documentation is important to AIS:**
 - Depicting how the system works
 - Training users
 - Designing new systems
 - Controlling system development & maintenance costs
 - Standardizing communication with others
 - Auditing AIS
 - Documenting business processes

The three important document tools/techniques are:

1. **Data flow diagram (DFD):** A graphical description of data sources, data flows, transformation processes, data storage, and data destinations.
2. **Flowchart**, which is a graphical description of a system. There are several types of flow charts, including:
 - a. **Document flowchart**, which shows the flow of documents and information between departments or areas of responsibility
 - b. **System flowchart**, which shows the relationship among the input, processing, and output in an information system.
 - c. **Program flowchart**, which shows the sequence of logical operations a computer performs as it executes a program.
3. **Business Process diagrams**, which are graphical descriptions of the business processes used by a company.

Data Flow Diagrams:

See the snippets below about what they are and how they work. Will be relevant to sub question one.

- Know the elements of the DFD and how to narrate the elements.

Focuses on the data flows for:

- Processes
- Sources and destinations of the data
- Data stores

Context diagram:

- Highest level (most general)
- Purpose: show inputs and outputs into system
- Characteristics: one process symbol only, no data stores

Level-0

- Purpose: show all major activity steps of a system

- Characteristics: processes are labelled 1.0, 2.0 and so on

Important elements in DFDs

- The narration -> a **structured narration** is a written description of how the process operates
 - o Pay attention to: what inputs are being used? What processes/activities are being carried out using the inputs? What outputs are generated as a result?
- The structured narrative table -> It is a means of summarising the narrative in a systematic way to emphasis who, what, activities occurring & the destination of the outputs

Important elements in DFDs

Process	Paragraph	Narrative
1. Receive Purchase Order	2	After opening the mail, the telephonist hands customers' purchase orders to the accounts receivable clerk ('AR').
	2	To prevent delays in despatch of orders, AR prepares a five part sales invoice for distribution.
2. Pick Inventory	3	In the warehouse the inventory is drawn as shown on copy 4 of the invoice with quantities adjusted as necessary. The warehouse copy is filed in date order as recorded on the invoice.
3. Execute Shipping Notice	4	The Despatch Department receives order from warehouse identified by the customer's name. Quantities and product descriptions are matched against invoice copies.
	4	Then the goods are prepared for shipment and a two-copy delivery docket prepared. Copy 3 of the invoice is placed in one carton as a packing slip.
	5	Copy 5 of the invoice is returned to the Accounts Receivable Department with the original delivery docket. A document number is assigned, the copy of which is filed numerically by the Despatch Department staff.
Reject from process 3	4	Where ordered quantities are more than can be supplied, Despatch Department staff alter both of their copies to agree with the quantity being supplied.
4. Post Sales	6	When copy 5 is received by the Accounts Receivable clerk he records on copies 1 and 2 the invoice number, actual quantities despatched, prices, extensions, discounts, if any, and total. Copy 1 is forwarded to the customer together with the original of the entry docket.
	7	The accounts receivable ledger and the sales journal are prepared simultaneously. To minimise errors sales are posted to the accounts receivable ledger and sales journal using copy 2 of the invoice which is subsequently attached to copy 5 and filed numerically.



Advantages:

- Promotes quick and relatively easy project code development
- Method is easy to learn
- Easy to read (Beneficial for communicating existing system knowledge to the users)
- DFD are visually simple and can be used to represent the same process at a high abstract (summary) or detailed level
- Saves time and money, adding value to an organisation
- Describes the boundaries of the system
- Easy to understand by technical and nontechnical audiences

Disadvantages:

- DFDs for large systems can become cumbersome, difficult to translate and read, and be time consuming to construct
- Physical considerations are left out.

Flowcharts

A flowchart is a pictorial, analytical technique used to describe some aspect of an information system in a clear, concise, and logical matter.

- Types of flowcharts:
 - o **Document flowcharts:** illustrate the flow of documents and data among areas of responsibility within an organisation.
 - A special type of flowchart, called an **internal control flowchart** is used to identify system weaknesses or inefficiencies, such as inadequate communication flows, insufficient segregation of duties, unnecessary complexity in document flows, or procedures responsible for causing wasteful delays.

- **Systems flowchart** depicts the relationships among system input, processing, storage and output.
- **Program flowchart** illustrates the sequence of logical operations performed by a computer in executing a program.

Flowcharts describe an information system showing:

- Inputs and outputs
- Information activities (processing data)
- Data storage
- Data flows
- Decision steps

Advantages:

- Easily capture control via decision points
 - Show manual vs. automated processes
- Saves time and money, adding value to an organisation
- Shows the logic and the relationship between input, processing and output.
- Is an analytical technique used to describe some aspect of an information in a clear, concise, and logical matter.
- Are easy to prepare and revise when the designed utilises a flowcharting software package.
- Don't display exception procedures and error routines to avoid clutter which therefore makes the flowchart more readable.

Disadvantages

- Complex logic: Flowcharts can become complex and clumsy. This will become a pain for the user, and may actually result in a waste of time and money trying to correct the problem.
- Alterations and modifications: If alterations are required, the flowchart may require re-drawing completely.
- Reproduction: As the flowchart symbols cannot be typed, reproduction of flowchart becomes a problem

Business Process Diagrams

Business Process Diagrams are a visual way to describe the different steps or activities in a business process.

- Intent is that all business user can easily understand the process from a standard notation

Advantages:

- Give an easily understood pictorial view of what takes place in a business process.
 - Show the activities that occur in each business process
- Flexibility in that there is less emphasis on obeying the rules governing their preparation and more on their clearly communicating the activities involved in the business process being depicted.
- Saves time and money, adding value to an organisation

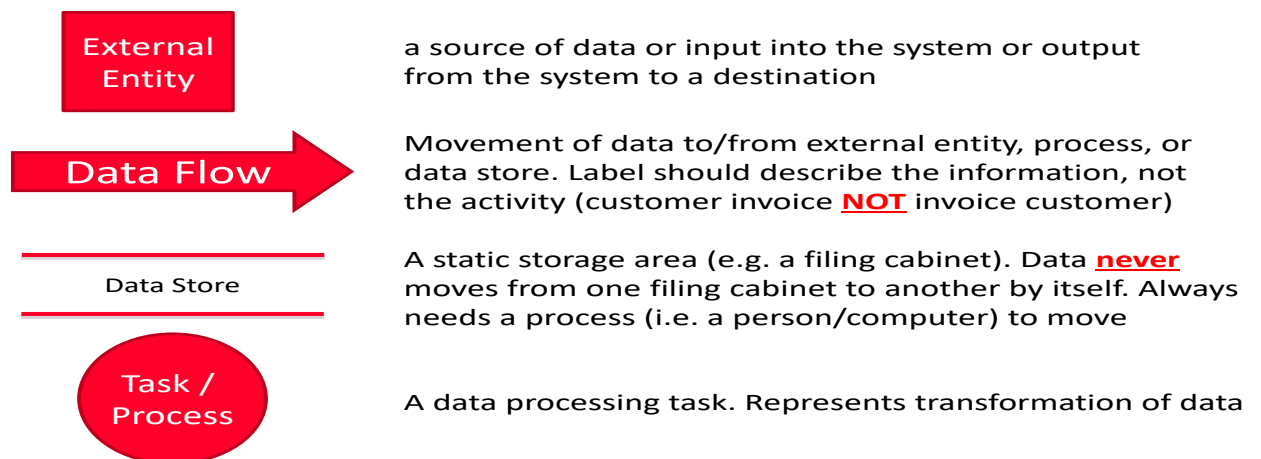
Disadvantages:

- ?

Symbol	Name	Explanation
	Data sources and destinations	The people and organisations that send data to and receive data from the system are represented by square boxes. Data destinations are also referred to as <i>data sinks</i> .
	Data flows	The flow of the data into or out of a process is represented by curved or straight lines with arrows.
	Transformation processes	The processes that transform data from inputs to outputs are represented by circles. They are often referred to as <i>bubbles</i> .
	Data stores	The storage of data is represented by two horizontal lines.

Data Flow Diagrams (DFD)

- Graphically describes the flow of data within a system
- Four basic elements:



Also note that an internal control is figured by a small orange triangle.

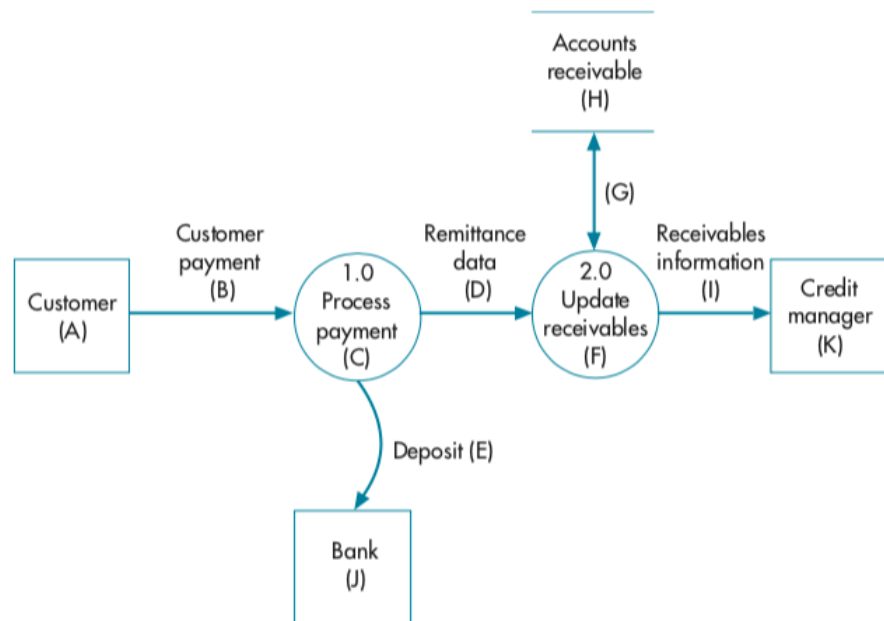
only exception is data flow between a process and a data store, such as data flow G in Figure 3.3, because the data flow is usually obvious. In data flow G, data from the accounts receivable file is retrieved, updated and stored back in the file. Other data flows in Figure 3.3 are B (customer payment but not cheque or cash as these are physical items or documents), D (remittance data), E (deposit) and I (receivables information).

If two or more data flows move together, a single line is used. For example, data flow B (customer payment) consists of payment and remittance data. Process 1.0 (process payment) splits them and sends data in different directions. Remittance data (D) is used to update accounts receivable records and the payment (E) is deposited in the bank. If data flow separately, two lines are used. For example, Figure 3.4 shows two lines because customer enquiries (L) do not always accompany a payment (B). If represented by the same data flow, separate elements and their different purposes are obscured, and the DFD is more difficult to interpret.

Processes represent the transformation of data. Figure 3.3 shows that process payment (C) splits the customer payment into remittance data and the cheque data, which is deposited in the bank. The update receivables process (F) uses remittance (D) and accounts receivable (H) data to update receivable records and send receivables information to the credit manager.

A **data store** is a repository of data. DFDs do not show the physical storage medium (such as a server, hard drive or paper) used to store data. As shown in Figure 3.3, data stores (H) are represented by horizontal parallel lines, with the name of the file written inside the lines.

FIGURE 3.3
Data flow diagram
of customer payment
process



Above is a Context DFD

Data flow diagrams

A DFD graphically describes the flow of data within an organisation. It uses the symbols shown in Figure 3.1 to represent four basic elements: data sources and destinations (a square), data flows (a line with a directional arrow), transformation processes (a circle) and data stores (horizontal lines). For example, Figure 3.2 shows that the input to process C is data flow B, which comes from data source A. The outputs of process C are data flows D and E. Data flow E is sent to data destination J. Process F uses data flows D and G as inputs and produces data flows I and G as output. Data flow G comes from and returns to data store H. Data flow I is sent to data destination K.

Figure 3.3 assigns specific titles to each of the processes depicted in Figure 3.2. Figures 3.2 and 3.3 will be used to examine the four basic elements of a DFD in more detail.

A *data source* and a *data destination* are entities that send or receive data that a system uses or produces. An entity can be both a source and a destination. They are represented by squares (not rectangles), as illustrated by items A (customer), J (bank), and K (credit manager) in Figure 3.3. Note, an entity is usually a physical being or object.

A *data flow* is the movement of data among processes, stores, sources and destinations. Data that pass between data stores and a source or destination must go through a data transformation process. Data flows are labelled to show what data is flowing and not a document. The

Level 0 DFD (Called level 0 because there are zero meaningful decimal points)

TABLE 3.2 Activities and data flows in payroll processing at S&S

Activity	Data inputs	Data outputs
1.0 Update employee/payroll file	New employee form Employee change form	Updated employee/payroll file
2.0 Pay employees	Time cards Employee/payroll file Tax rates table	Employee cheques Payroll register Updated employee/payroll file Payroll cheque Payroll cash payments voucher
3.0 Prepare reports	Employee/payroll file	Payroll report
4.0 Pay taxes withheld	Employee/payroll file	Tax withheld report (included in BAS) Tax withheld payment Withholding tax cash payments voucher Updated employee/payroll file
5.0 Update general ledger	Withholding tax cash payments voucher Payroll cash payments voucher	Updated general ledger

FIGURE 3.6
Level 0 data flow
diagram for S&S
payroll processing

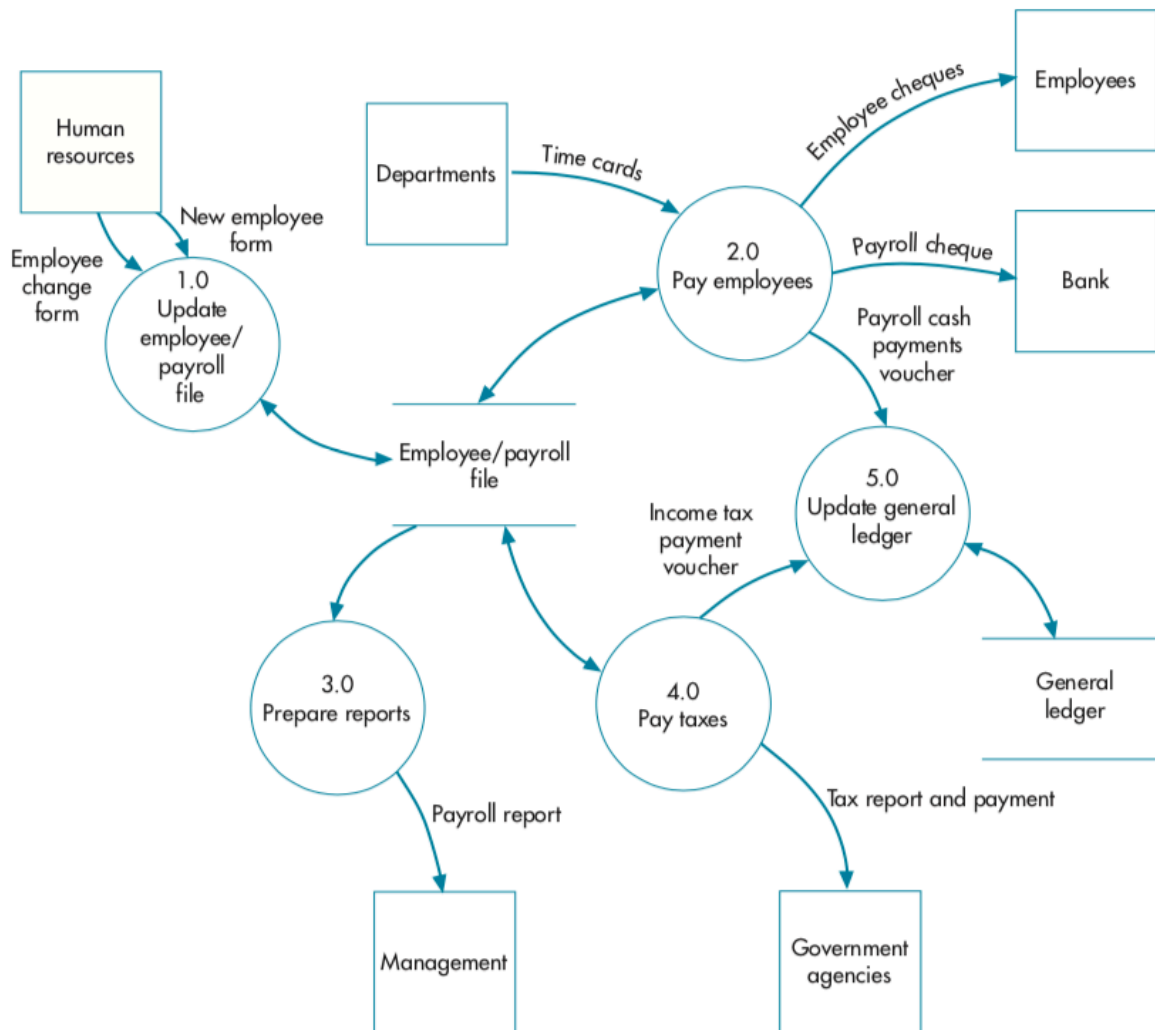
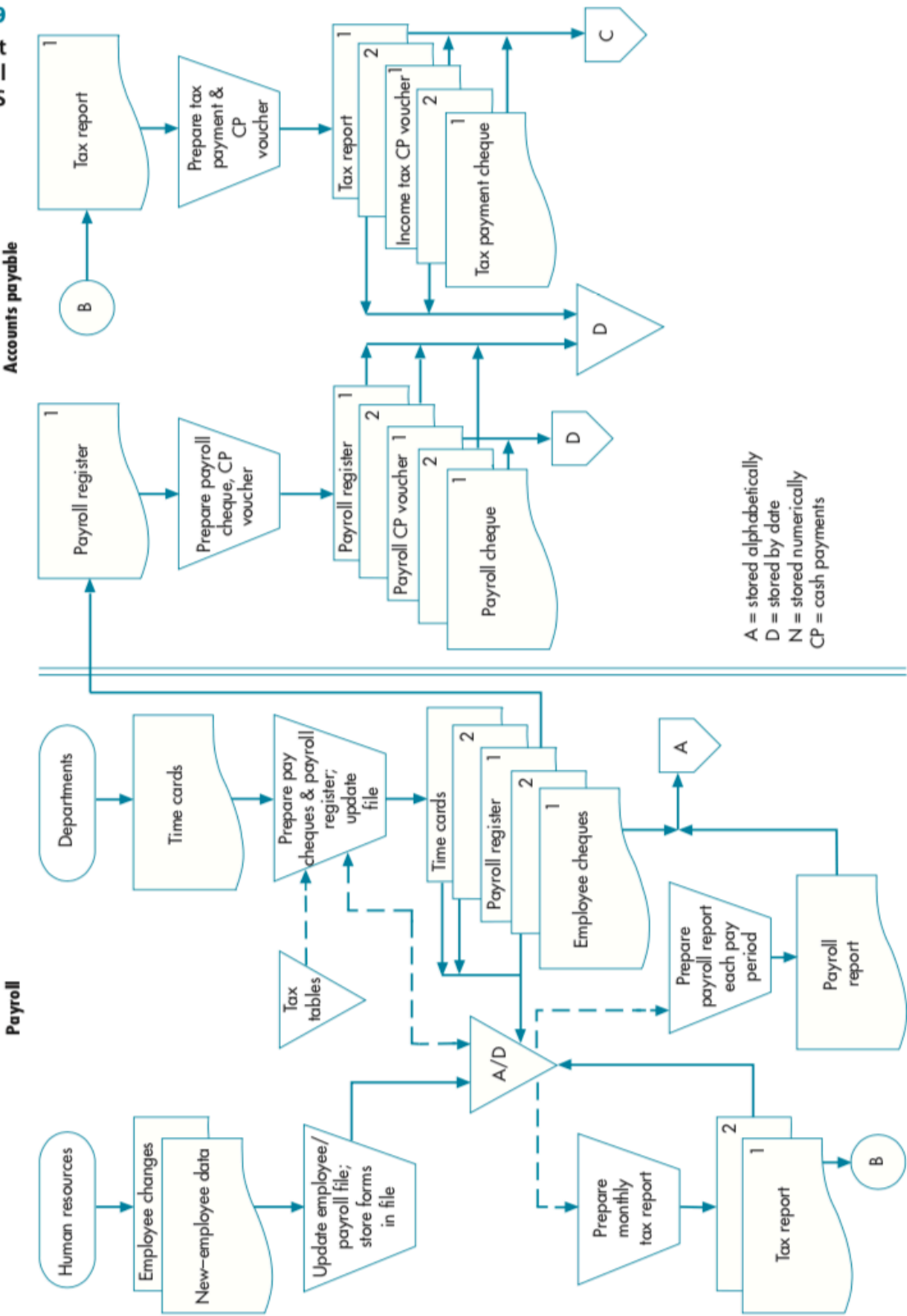


FIGURE 3.9

Document
flowchart of payroll
processing at S&S



SA - Q3

- This question is based on **Chapter 8 (Controls for Information Security)** of Romney and Steinbart (2018) which was covered in **week 5 Lecture**
- This is a critical thinking/practical question
- Read carefully pages 263-267 (which include **Introduction, Two Fundamental Information Security Concepts and Understanding Targeted Attacks**)
 - More like an agree/disagree question.
 - Need to justify this view using the information from between those pages
 - It is a practical situation which you have to respond to.

Notes from p 263-267

Controls for Information Security

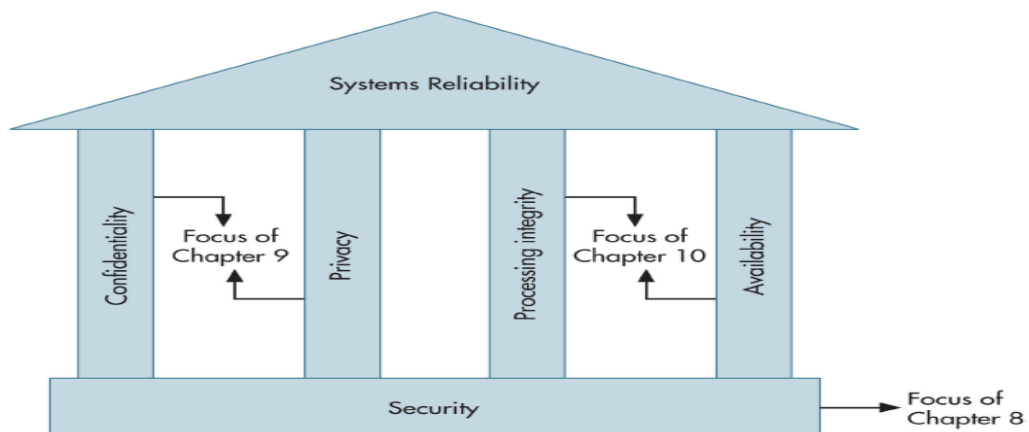
Introduction:

The Trust Services Framework organises IT-related controls into five principles that jointly contribute to systems reliability:

1. **Security:** Access (both physical and logical) to the system and its data is controlled and restricted to legitimate users.
2. **Confidentiality:** Sensitive organisation information is protected from unauthorised disclosure
3. **Privacy:** Personal information about customers, employees, suppliers or business partners is collected, used, disclosed, and maintained only in compliance with internal policies and external regulatory requirements and is protected from unauthorised disclosure.
4. **Processing Integrity:** Data are processed accurately, completely, in a timely manner, and only with proper authorisation
5. **Availability:** The system and its information are available to meet operational and contractual obligations

Information security is the foundation of system reliability and is necessary for achieving each of the other 4 subheadings.

Trust Services Framework



Two Fundamental Information Security Concepts:

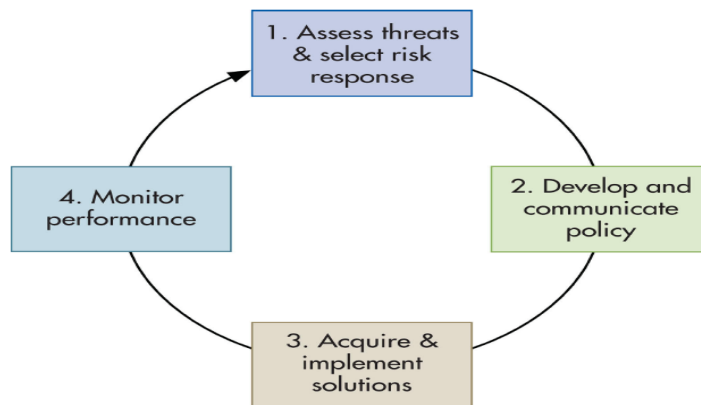
1. Security is a management issue, not just a technology issue:

Security Life Cycle

1. Assess the information security-related threats the organisation faces and select an appropriate response.
 - Information security professionals possess the expertise to identify potential threats and to estimate either likelihood and impact.
2. Developing information security policies and communicating them to all employees
 - Top management is necessary to ensure that information security training and communication are taken seriously.
 - Regular reminders should be given about complying with security policies
3. The acquisition or building of specific technological tools that mitigate threats identified.
4. Regular monitoring of performance to evaluate the effectiveness of the organisation's information security program.

Security Life Cycle

- A method of initiating & maintaining a security plan. It involves 4 steps:



2. The time-based model of information security

- The goal is to employ a **combination of preventive, detective, and corrective controls to protect information assets long enough** to detect attacks and take timely steps to thwart the attack before any information is lost or compromised.

Expressed as

$$P > D + R, \text{ where}$$

P = the time it takes an attacker to break through the various controls that protect the organisation's information assets

D = the time it takes for the organisation to detect that an attack is in progress

R = the time it takes to respond to and stop the attack

- Defence-in-depth:

- Organisations attempt to satisfy the objective of the time-based model of security by employing the strategy of **defence-in-depth**.
 - Entails using **multiple layers of controls** in order to avoid having a single point of failure.

- This technique acknowledges that although no one control can be 100% effective, the use of overlapping, complementary, and redundant controls increases overall effectiveness because **if one control fails or gets circumvented, another may succeed.**
- This equation is not an exact science .

Understanding Targeted Attacks

The basic steps criminals use to attack an organisation's information system:

1. **Conduct reconnaissance:**
 - a. Computer attackers will attempt to collect as much information as possible about their target as well as its vulnerabilities.
2. **Attempt social engineering:**
 - a. Social engineering is using deception to obtain unauthorised access to information resources
 - i. *Spear phishing* for example involves sending e-mails purportedly from someone that the victim knows and then that person clicks on the embedded link where a Trojan horse program is executed that enables the attacker to obtain access to the system.
 - ii. Spreading USB drives in the targeted organisations parking lot.
3. **Scan and map the target**
 - a. If the attacker cannot penetrate the target system via social engineering, the next step is to conduct more detailed reconnaissance to identify potential points of remote entry. The attacker uses a variety of automated tools to identify computers that can be remotely accessed and the types of software they are running
4. **Research**
 - a. Once the attacker has identified specific targets and knows what versions of software are running on them, the next step is to conduct research to find known vulnerabilities for those programs and learn how to make advantage of those vulnerabilities.
5. **Execute the attack:**
 - a. Taking advantage of the vulnerability
6. **Cover tracks**
 - a. Creating 'back doors' that they can use to obtain access if their initial attack is discovered and controls are implemented to block that method of entry.

Q4

- These questions are based on **the week 8 lecture (the Revenue Cycle) – Chapter 12** of Romney and Steinbart (2018)
- Don't memorise activities, threats and controls -> Understand instead
- 2 sub-questions in relation to this topic
- **First sub-question:** Critical thinking/scenario about one of the activities of the Revenue Cycle
 - o Situation:
 - o One of the activities of the revenue cycle. Need to understand the main activities and how the data flows.
- **Second sub-question:** Practical -> Controls based on threats
 - o Scenario – revenue cycle – can you suggest anything – can you identify the threat – we have practiced this apparently – check tutes
- 4 processes – link to pre sales – delivery – shopping – collection – understand where controls are

From Lecture Slide about DFDS (mentioned exam here but probably not gonna come up): Your colleague said that it took a while but eventually she got the idea that all internal entities to the organisation must be within the system of interest. Similarly, all external entities must be outside the system of interest. **Do you agree or disagree?**

- **A. Disagree**
 - **Distinction between internal & external entities is based on the activities that an entity performs in relation to the process or system of interest, not their geographic proximity to the firm**

Notes

Why is the Revenue Cycle (RC) important?

- Businesses need money to survive
- It is useful to maintain a steady stream of income for our business, especially under situations in which cash flows are declining, margins are tightening, and bad debt increasing
- For an organisation to prosper it's essential that the revenue cycle is well managed & controlled
 - After all, companies need to get revenues in order to survive
- Sales are easily lost if consumers are confronted with an inadequate sales process or improper billing practices

Which organisational units have primary responsibility for the revenue cycle?

- Marketing, sales & finance are the organisational units that have primary responsibility for the RC
 - **Marketing**
 - Need to market to advertise products
 - **Finance**
 - Need to get paid and be able to chase up debts – don't want to have a lot of money in debts because then you have a risk of illiquidity
 - **Sales**
 - Need to be able to sell your product and have multiple platforms to do so.

What is the revenue cycle?

- A set of **exchange** transaction contracts between the firm and its customers associated with:
 - Providing goods and services to customers
 - Collecting their cash payments
- Primary objective ...
 - **To provide the right product in the right place at the right time for the right price**
- **To achieve this primary objective, it is important to:**
 - Effectively conduct, record & monitor sales of goods & services
 - Monitor inventory to ensure you always have enough to sell to meet orders
 - To arrange the prompt supply of goods and services
 - To ensure payments for goods and services are correctly received, recorded and banked

4 Activities of the cycle are:

1. Sales Order entry
 - a. Need to receive the order from clients.
 - b. This is mainly from business to business (cause we are talking about creditors)
2. Shipping
3. Billing and accounts receivable
4. Cash collection

3 basic functions are performed in each activity:

1. Capturing and **processing** data
2. **Storing** and organisation data for decisions
3. Providing controls to **safeguard** resources (including data)

Specific activities to each activity:

Sales order entry

- 1) Take customer orders
 - Customer Order data are recorded on a **sales order** document
 - Many businesses are online to increase sales (**websites**)
- 2) Approve customer credit
 - For exiting customers will well-established payment credit histories, a formal credit check for each sale is usually unnecessary.

- Credit Limit -> Credit Approval (MUST be before)
 - i. Credit limit is the maximum allowable account balance that management wishes to allow for a customer based on that customer's past credit history and ability to pay.

Once you approve the sale you need to

3) Check Inventory Availability

- Check whether sufficient inventory is available
- Is it sufficient? If not -> **Back order**
 - i. Back order is an order within the company to get make more of the stock to then on-sell.
- Once availability is determined -> **Picking ticket**
 - i. Picking ticket authorises the inventory control function to release the goods and allows for delivery and collection.

4) Responding to Customer Enquiries

- Not just customer orders!!!
- Respond promptly and accurately is extremely important to a company's long run success.
- Customer service is important -> Some companies use **Customer Relationship Management (CRM) systems**.
 - i. Allows companies to get in touch with their consumers anywhere. Quick and personnel with real time customer support. Identify leads with prospective clients. Allows you to control all business relationships, employees, customers and partners.

Shipping

1) Pick

- o The picking ticket is generated by the sales order entry and is used to identify which products, and quantity of each product, to remove from inventory.

2) Pack

3) Deliver/ship

- o The shipping department should compare the physical count of inventory with the quantities indicated on the picking ticket and with the quantities indicated on the sales order.

Billing

- 1) Invoicing
- 2) Maintain (update) accounts receivable

Cash Collection

- 1) Process
 - a. Through remote deposit software, electronic lockbox, electronic funds transfer (EF) or Financial electronic data interchange (FEDI)

2nd sub-question

- Practical -> Controls based on threats
 - Scenario – revenue cycle – can you suggest anything – can you identify the threat – we have practiced this apparently – check tutes
- 4 processes – link to pre sales – delivery – shopping – collection – understand where controls are

Normally there shouldn't be an interaction between external entities – between carrier and external entities for example

General RC Threats

1. Inaccurate or invalid master data
 - a. **Controls:**
 - i. Data processing integrity controls
 1. Data-validation for example
 - ii. Restriction of access to master data
 - iii. Review of all changes to master data
 - iv. Control: EDI – Electronic Data Interchange – allows you to instantly exchange information with a partner – reduce user input preventing human error and improves

efficiency. Often more cost efficient to implement an EDI rather than to continue to use old systems

2. Unauthorised disclosure of sensitive information

a. **Controls:**

- i. Access controls
- ii. Encryption
- iii. Tokenization of customer personal information
 1. Covert sensitive private information into a token. If someone then steals the data, they won't be able to see anything. You would have stolen a surrogate value that would have absolutely no meaning.
 2. Takes the information out of the environment. You can't get back to the original value. Good for organisations that don't need to retain sensitive data or ever get back to it.

3. Loss or destruction of master data

a. **Controls:**

- i. Backup and disaster recovery procedures

4. Poor performance

a. **Controls:**

- i. Managerial reports

Specific threats and controls:

Sales Order entry

1. Incomplete/inaccurate orders

i. Data entry edit controls

1. Through Electronic Data interchange – allows automatic processing by the company.

ii. Restriction of access to master data

2. Invalid orders

i. Digital signatures of written signatures

3. Uncollectible accounts

i. Credit limits

1. The person who sets the credit policies should be independent from the marketing function. To enforce this segregation of ERP systems, sales order entry clerks should be granted read-only access to information about individual customer credit limits; the ability to change credit limits should be granted only to the credit manager.

ii. Specific authorisation to approval sales to new customers or sales that exceed a customer's credit limit

4. Stockouts and excess inventory

i. Perpetual inventory control system

ii. Use of bar codes or RFIC

iii. Training

iv. Periodic physical counts of inventory

5. Loss of customers

i. CRM systems, self-help websites, and proper evaluation of customer service ratings

Shipping

1. Picking wrong item or quantity to ship

a. Bar-code and RFID (radio frequency ID) technology/chips

b. Reconciliation of picking lists to sales order details

2. Theft

a. Restriction of physical access to inventory

b. Documentation of all inventory transfers

c. RFID and bar-code technology

- d. Periodic physical counts of inventory and reconciliation to recorded quantities
- e. Cameras/Surveillance
- 3. Shipping errors (fail to ship the goods, wrong quantities, wrong items, ship to wrong address, duplication)
 - a. Reconciliation of shipping documents with sales orders, picking lists, and packing slips
 - b. RFID to identify delays
 - c. Bar-code scanners
 - d. Configuration of ERP system to prevent duplicate shipments.

Billing

- 1. Failure to bill
 - a. Separation of billing and shipping functions
 - b. Periodic reconciliation of invoices with sales orders, picking tickets, and shipping documents
- 2. Billing errors
 - a. Configuration of system to automatically enter pricing data
 - b. Restriction of access to pricing master data
 - c. Data entry edit controls
 - d. Reconciliation of shipping documents (picking tickets, bills of lading, and packing list) to sales order
- 3. Posting errors in accounts receivable
 - a. Data entry controls
 - b. Reconciliation of batch controls
 - c. Mailing of monthly statements to customers
 - d. Reconciliation of subsidiary accounts to general ledger
- 4. Inaccurate or invalid credit memos
 - a. Segregation of duties of credit memo authorisation from both sales order entry and customer account maintenance

Cash Collection

- 1. Theft of cash
 - a. Segregation of duties – the person who handles payments from customers should not also:
 - i. Post remittances to customer accounts
 - ii. Create or authorise credit memos
 - iii. Reconcile the bank account
 - b. Use of EFT, FEDI, and lockboxes to minimise handling of customer payments by employees
 - c. Immediately upon opening mail, create list of all customer payments received
 - d. Prompt, restrictive endorsement of all customer checks
 - e. Having two people open all mail likely to contain customer payments
 - f. Use of cash registers
 - g. Daily deposit of all cash receipts
- 2. Cash flow problems
 - a. Lockbox arrangements, EFT, or credit cards
 - b. Discounts for prompt payment by customers
 - c. Cash flow budgets

Example:

Which internal control procedure would provide protection against the following threat??

Question: Theft of goods by the shipping dock workers, who claim that the inventory shortages reflect errors in the inventory records

Answer: Counting goods when they are received and when they are sent to inventory storage as well as when goods leave inventory storage and are sent to shipping helps maintain control over inventory

- Reconciling the 2 sets of counts makes it more difficult for employees to steal inventory as it is received and shipped.

Data Flows for Sales order Entry

FIGURE 7.5
Level 1 data flow
diagram: Sales order
entry

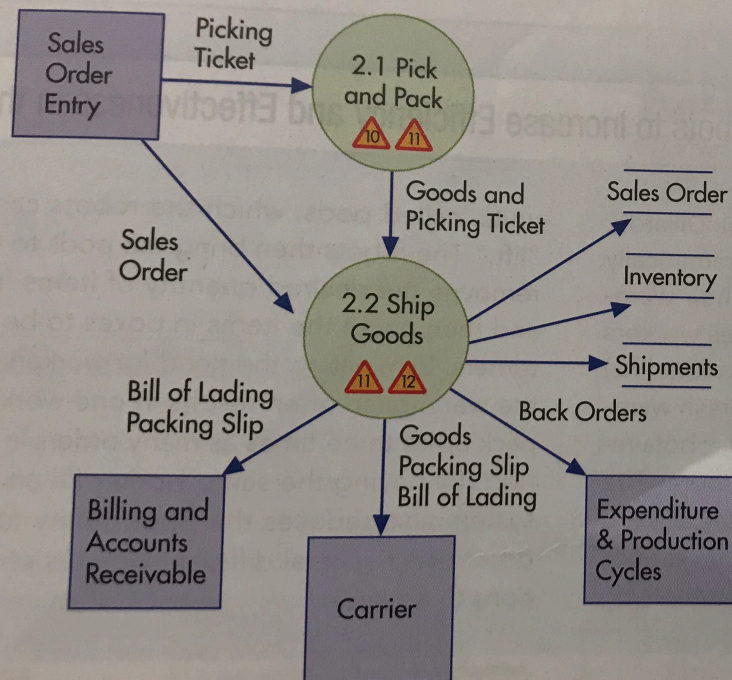
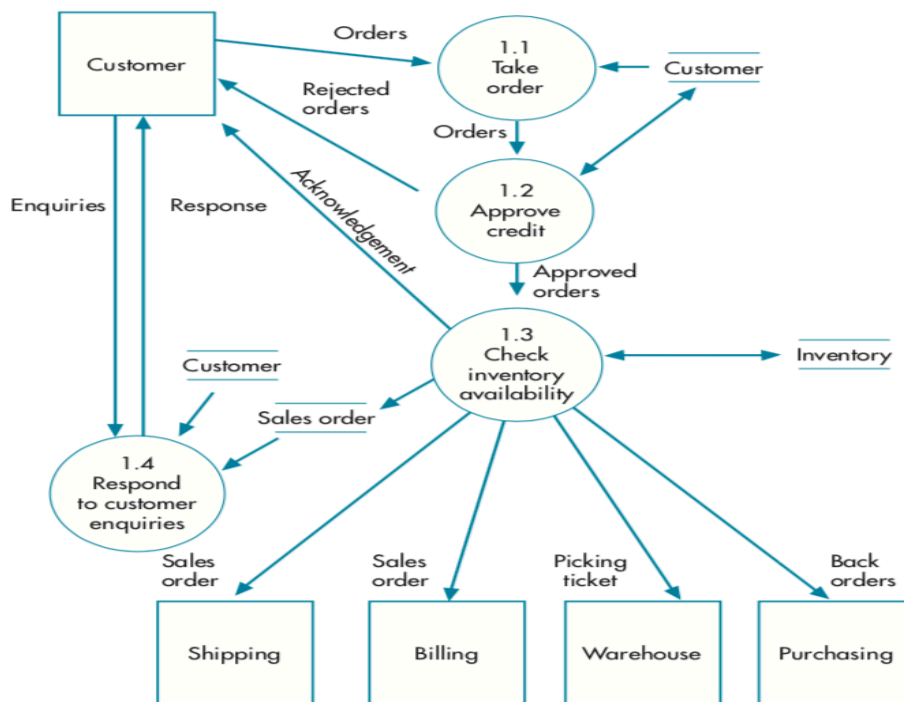


FIGURE 12-11
Level 1 Data Flow
Diagram: Shipping
(annotated to include
threats)

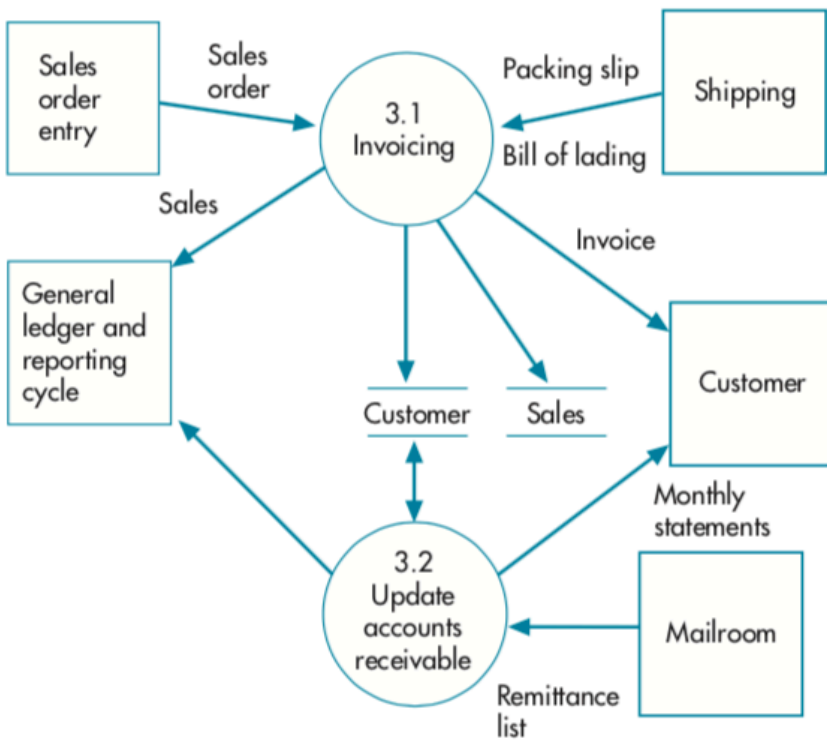
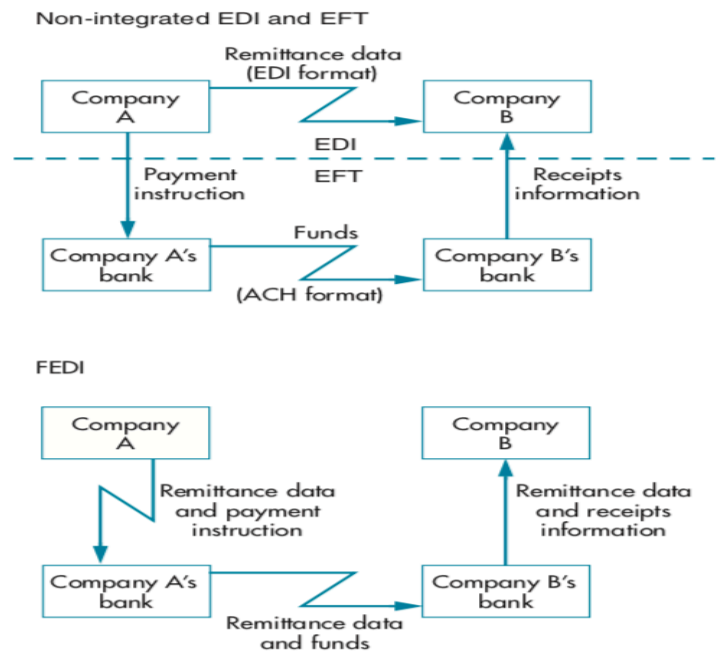


FIGURE 7.13
Level 1 data flow
diagram: Billing
process

FIGURE 7.17
Electronic funds
transfer and financial
electronic data
interchange



SA - Q5

- The main reference for this question is **Week 3 Lecture (Ethics in AIS, Fraud & Cybercrime)**, more specifically you would need to review one of the additional readings [re. **Romney et al. (2013) – pages 21-24 (see reading list)**]
- This is a practical question/critical thinking
- All about the framework – weeks 9,10,11 tutorials look at them, there is an ethics question from past exam (too big though) – however, the tutorial questions are the better ones to look at
 - o Fraud and Cyber crime
 - o Similar to tutorial question 11

Pages 21-24

Corporate and professional code of ethics

- Accountants have incentives to behave ethically. As professionals, they are expected to maintain higher standards than society in general. Their ability to attract business depends entirely on their reputation
- Bound by Codes of Conduct by the CPAA, ICAA, IPA and CIMA which set out minimum standards of conduct for members
- Unacceptable actions can result in expulsion for the organisation.

Stakeholder analysis framework

- Weighing tough ethical judgments requires a decision framework, such as a ***stakeholder analysis framework***. Only way to do it is to follow a decision framework that takes all stakeholders' effects into account before arriving at the most ethical action to take

Ethical issues in information systems

- Proliferation of computers and information systems create ethical dilemmas as the law struggles to keep up to speed with new technologies which makes the setting of ethical guidelines difficult.
- The gathering of data presents a big ethical dilemma: I.e who should have access to confidential information. This concern is heightened when there is large amounts of data that is stored in large databases and data warehouses which are susceptible to misuse.

What is acceptable use?

- The way to disseminate acceptable behaviour is to have a written policy outlining what is permitted and any restrictions.
- What is tracked needs to be included in the policy and all staff need to be reminded regularly about what is acceptable.

IMPORTANT: TEMPLATE TO USE WHEN CONFRONTING AN ETHICAL ISSUE

TABLE 1.3 Template to use when confronting an ethical issue

Question	Decision guidelines
1. <i>What is the ethical issue?</i>	1. <i>Recognise the ethical issue or dilemma.</i> The root word of ethical is <i>ethics</i> , which the <i>Oxford Dictionary</i> defines as ‘a set of moral principles, especially ones relating to or affirming a specified group, field or form of conduct’. Duncan’s ethical dilemma is to decide what he should do with the information he has uncovered.
2. <i>What are the principle elements in this situation?</i>	2. <i>Move towards an ethical resolution by answering these questions in sequence.</i>
a. What parties (stakeholders) may be harmed?	a. Investor, financiers such as banks, creditor; in the long-run, employees
b. Whose rights or claims may be violated?	b. Investor, financiers, creditor
c. Which specific interests are in conflict?	c. To deliberately understate liabilities on the balance sheet is dishonest, possibly fraudulent and unethical. It contravenes most of the fundamental principles of the APES 110 Code of Ethics for Professional Accountants: Integrity, Objectivity, Professional Competence and Due Care, and Professional Behaviour. ²⁴
d. What are Duncan’s (my) responsibilities and obligations?	d. Auditors are bound by their profession’s Code of Ethics and they have a duty of care that extends beyond the firm, colleagues and shareholders and includes other stakeholder groups who may not have a financial interest in the firm, including the community
3. <i>What are Duncan’s options and what are the consequences?</i>	3. <i>Specify alternatives and weigh up impacts of each on various stakeholders.</i> For David Duncan, the alternatives include: a. go along with Enron’s liabilities as reported, or b. force Enron to report higher amounts of liabilities. Impact of alternatives on stakeholders include: a. If Duncan certifies Enron’s present level of liabilities—and if no one ever objects—Duncan will keep this valuable client. But if Enron’s actual liabilities turn out to be higher than reported, Enron investors may lose money and take Duncan to court. That would damage his reputation as an auditor and hurt his firm. b. If Duncan follows his company policy, he must force Enron to increase its reported liabilities. That will anger the company, and Enron may fire Duncan as its auditor. In that case, Duncan will save his reputation, but it will cost him some business in the short run.
4. <i>What shall I do?</i>	4. <i>Select the best or most ethical alternative considering all the circumstances and consequences.</i> In fact, Duncan went along with Enron and certified the company’s liabilities. He acted against his firm’s policies. Enron later admitted understating its liabilities, Duncan had to retract his audit opinion and Duncan’s firm, Arthur Andersen, was closed down. Duncan should have followed ethical principles as well as firm policy. Not doing so cost him and many others dearly.

Source: C.T. Horngren, P. Best, D. Fraser & R. Willett (2009). *Financial Accounting* 6th edition, Pearson Australia, Sydney.

SA - Q6

- These questions are based on Week 4 lecture (**Control and Accounting Information Systems**) – **Chapter 7 of Romney and Steinbart (2018)**
- **First sub-question:** Practical/critical thinking question about threats and internal controls. Make sure you are familiar with the differences between Preventive, Detective and Corrective Controls
- **Second sub-question:** Critical Thinking based on the first sub-question
- **Third sub-question:** It is a general 'define/explain' type of question
 - o Make sure you review **page 224 (Overview of Control Concepts including 3 functions and 2 categories of internal controls) AND**
 - Preventive, detective and corrective

Page 224

Definitions:

- **Preventive controls:** Controls that deter problems before they arise.
 - o Examples include hiring qualified personnel, segregating employee duties, and controlling physical access to assets and information.
- **Detective controls:** Controls designed to discover control problems that were not prevented.
 - o Examples include duplicate checking of calculations and preparing bank reconciliations and monthly trial balances.
- **Corrective controls:** Controls that identify and correct problems as well as correct and recover from the resulting errors
 - o Examples include maintaining backup copies of files, correcting data entry errors, and resubmitting transactions for subsequent processing.

Internal controls are often segregated into two categories:

1. **General controls:** Controls designed to make sure an organisation's information system and control environment is stable and well managed.
 - o Examples include security, IT infrastructure, software acquisition, development, and maintenance controls.
2. **Application controls** prevent, detect, and correct transaction errors and fraud in application programs. They are concerned with the accuracy, completeness, validity, and authorisation of the data captured entered, processed, stored, transmitted to other systems, and reported.

- o **Pages 234 to 238 (Objective Setting and Event Identification AND Risk Assessment and Risk Response)**

Pages 234-238

Objective setting:

- o Objective setting is the second Enterprise Risk Management component.
- o Management determines what the company hopes to achieve, often referred to as the corporate vision or mission.
- **Strategic objectives:** High-level goals that are aligned with and support the company's mission and create shareholder value
- **Operations objectives:** Objectives that deal with the effectiveness and efficiency of company operations and determine how to allocate resources
- **Reporting objectives:** Improve accuracy, completeness and reliability of company reports to improve decision making and monitor performance
- **Compliance objectives:** Objectives to help ensure the accuracy, completeness, and reliability of company reports

Most reporting and compliance objectives are imposed by external entities in response to laws or regulations.

- ERM provides reasonable assurance that reporting and compliance objectives are achieved because companies have control over them. However, the only reasonable assurance ERM can provide about

strategic and operations objectives, which are sometimes at the mercy of uncontrollable external events, is that management and directors are informed on a timely basis of the progress the company is making in achieving them.

Event Identification:

- Identifying incidents both **external** and **internal** to the organisation that could **affect the achievement of an organisations objectives**
 - o A positive event represents an opportunity; a negative event represents a risk.

Risk Assessment and risk response

Companies should assess inherent risk, develop a response, and then assess residual risk.

- **Inherent risk** is the susceptibility of a set of accounts or transactions to significant control problems in the absence of internal control
- **Residual risk** is the risk that remains after management implements internal controls or some other response to risk.

Management should respond to risk in one of four ways:

- **Reduce:** Reduce the likelihood and impact of risk by implementing an effective system of internal controls
- **Accept:** Accept the likelihood and impact of the risk
- **Share:** Share risk or transfer it to someone else by buying insurance, outsourcing an activity, or entering into hedging transactions
- **Avoid:** Avoid risk by not engaging in the activity that produces the risk. This may require the company to sell a division, exit a product line, or not expand as anticipated.

One way to estimate the value of internal controls involves **expected loss**, the mathematical product of impact and likelihood:

$$\text{Expected loss} = \text{Impact} \times \text{Likelihood}$$

So process is:

1. Identify the events, or threats, the confront the company
2. Estimate the likelihood, or probability of each threat occurring
3. Estimate the impact, or potential loss, from each threat
4. Identify controls to guard against each threat
5. Estimate the costs and benefits from instituting controls
6. Is it cost beneficial to protect the system from a threat?
 - a. IF YES, reduce risk by implementing controls to guard against the threat
 - b. IF NO, avoid, share, or accept risk.