9.4.1 Option 1: Transaction Processing Systems

Information systems that collect, store, modify and retrieve records of transactions are transaction processing systems. A transaction is an event that generates or modifies data that is eventually stored in an information system. Transaction processing systems meet record keeping and event tracking needs. In addition, analysing data stored in transaction processing systems may meet the information needs of end user(s). This option focuses on the information process of storing/retrieving. Other information processes are important in transaction processing and these are also considered.

Outcomes

A student:

H1.1   applies and explains an understanding of the nature and function of information technologies to a specific practical situation
H1.2   explains and justifies the way in which information systems relate to information processes in a specific context
H2.1   analyses and describes a system in terms of the information processes involved
H2.2   develops and explains solutions for an identified need which address all of the information processes
H3.1   evaluates and discusses the effect of information systems on the individual, society and the environment
H3.2   demonstrates and explains ethical practice in the use of information systems, technologies and processes
H4.1   proposes and justifies ways in which information systems will meet emerging needs
H5.1   justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
H5.2   assesses the ethical implications of selecting and using specific resources and tools, recommends and justifies the choices
H6.1   analyses situations, identifies needs, proposes and then develops solutions
H6.2   selects, justifies and applies methodical approaches to planning, designing or implementing solutions
H7.1   implements and explains effective management techniques
H7.2   uses methods to thoroughly document the development of individual and team projects.

1. **Characteristics of transaction processing systems**	
Students learn about:	*Notes:*

▪ a transaction – a series of events important to an organisation that involve a request, an acknowledgement, an action and an outcome	▪ Transaction: A series of events that work together and is important to the organisation.
	▪ Transaction have two outcomes, either a full success or a complete failure.
	▪ Example:
	  – Hiring, firing
	  – Transporting goods
	  – Making phone calls
	  – POS
	  – Credit card transaction
	  – E-commerce
	  – Reservation system.

• the components of a transaction processing system, including:
  – purpose
  – data
  – information technology
  – processes
  – participants
	▪ The components relate to the diagrammatic representation of an information system
	  – Purpose
	    ▪ Aim and the purpose of the information system.
	  – Data
	    ▪ Data quality, mainly data integrity is the main characteristic of TPS, as data can be altered, and even fail to process.
	    ▪ Storing and retrieving is the one of main processes of data, where TPS data are usually stored in relational databases.
	    ▪ The stored data is usually transformed into information using the processes.
	  – Information Technology
	    ▪ The hardware and software of the system. In modern day, most information technology come from the web or the internet.
	    ▪ Typical Hardware
	      – Server machine ➔ improve fault tolerance
	        ▪ If one server failures or is taken offline for maintenance, other servers will help reduce issues.
	        ▪ For larger organisation the use of mainframe computer are used to maintenance thousands of users.
	      – Storage device ➔ mirrored RAID,
	        ▪ TPS deal with finance and an organisation's loss can hinder the company. Hence mirrored RAID are implemented.
	        ▪ Though they may be more of redundant component, they ensure that all data is available encase of failure in one of the devices.

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	– Transmission media
	    – Backup device
	    – Workstations
	  ▪ Software
	    – DMBS software
	    – Client application
	    – Proprietary software
	    – Transaction processing monitors [TPMs]
	       ▪ TPMs are software that monitor the process of transaction and controls the commit and rollback made.
	       ▪ Provides response and requests.
	       ▪ Equipped with a data security to ensure that the transaction do not get lost or stolen.
	– Processes
	  ▪ Seven process [COAST DP]
	  ▪ TPS mainly uses Collecting and Storing and Retrieving
	  ▪ Collecting
	    – Collecting is an important process as correct transaction must be collected so that no one can get an advantage.
	    – Also, checks for the accuracy of data.
	  ▪ Storing and retrieving
	    – This process is important as it keeps the record of the transaction as evident of any purchases and financial transactions.
	    – This allows for verification and keeps participants inform about the committed and rollback.
	    – Storing the data also show the profits, losses, tax and emerging trends.
	– **Participants**
	  ▪ Anybody who interacts directly with a transaction processing system. They are required to initate the transaction, and are usually the people who work for the organisation that does this.
	  ▪ Example [ATM]
	    – A user enter data and therefore causes change to the transaction, either withdrawing, checking or entering money.
	    – The transaction process is immediately executed.

▪ batch transaction processing – the collection and storage of data for processing at a scheduled time or when there is sufficient data	▪ Batch transaction processing: The collection and storage of data for processing at a scheduled time or when data is sufficient.
	▪ Procedure
	  – First data is collected as a group (batch)
	  – The transactions and data is sorted and stored.

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	– When the time comes for batch processing, a transaction file, containing the accumulative transaction data, is submitted and processed.
	– During the batch processing each transaction is executed and operates the same way as TPS, commit if successful and roll back if fail.
	– Committed transactions are permanently written onto the master file.
	– Roll back transactions are analysis and details of the problems are written in an error file [log].
	– Having details of the rollback allows batch processing to continue executing transaction without the need for user interactions.
	▪ Important features
	– Transaction file ➔ provides all the previous inputs of transactions and data.
	– Master file ➔ Storage file for all the committed transactions.
	– Error file ➔ Storage file detailing all the rollback transactions.
	▪ Batch processing data is usually stored in paper form or on magnetic tapes.
	▪ Examples
	– Job salary
	– Invoices
	– Bulk buying
	– Hotel reservations
	– Electricity bills
	▪ Advantages
	– Cheaper
	– Will run on schedule and improve time convenience.
	– Can be operated without the need of humans.
	▪ Disadvantages
	– Roll backs can sometime cause the process to fail the whole thing.
	– Restarts and resets will occur if there is a problem.
	– Data is exclusive and data is not shared.
▪ real time transaction processing – the immediate processing of data	▪ Real time processing: The immediate processing of data.
	▪ Real time can also be called Online Transaction Processing [OLTP]
	– Completes transaction as soon as they are initiated.
	▪ Procedure
	– When the user participates with the system they become the participant

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	– When a data is inputted and entered the data is immediately processed for a reasonably time frame. – The process must usually take a few seconds, but over period of seconds a feedback must be provided. – These transmission speed cannot be controlled by the organisation. So once the transaction is processed over the internet, [the packet reach the internet], it will depend on the speed of data access an transmission over the internet. – Also, real time, fast and secure links are be maintained to prevent failure in the processing. Direct access is used to have fast storage access. ▪ Important features – Feedback ➜ The response time of the process. Usually indicated through a buffing icons or a process bar. – Response time ➜ affects the users decisions and outcome of the transaction. ▪ Speed of transmission. ▪ Speed of data access. ▪ Fast and secure communication links. ▪ Direct access to secondary storage. ▪ Real time [OLTP] data is usually stored online. ▪ Example – Reservation systems – Online web store – Library loan system – POS ▪ Advantage – Data is up to date and accurate. – Any roll back or errors can be corrected. – No wait time or time lapse. [immediate action is taken] – Allows the process to reflection on the current situation. ▪ Disadvantages – High expense is required. – Needs both powerful processing hardware and software to keep up in real time processing. – Will require a human operator to maintain the transaction process
▪ the significance of data validation in transaction processing	▪ Data validation – Data validation checks to ensure that the data entered is reasonable an matches the required data type. – In TPS, to increase the data validation usually involves a transaction initiation and field checking.

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	▪ The data entered must for some value and hence is the initiative for the transaction process.
	▪ But the data entered must match with the required data type, and to ensure that, usually the client application performs the data type.
	– Data validation essentially has:
	  ▪ Certain data type ➔ forces the user to enter the required data.
	  ▪ Required data ➔ A must enter data field or the transaction process can't occur.
	  ▪ Data range ➔ A maximum or minimum allowable criteria.
	– Although data validation help increase the criteria of data input, human can occur.
	  ▪ Eg. 54 can be input with 45 and hence data validation will fail to detect this problem.

▪ the historical significance of transaction processing as the first type of information systems	▪ First type of TPS was used by Greeks and Egyptians as the keep records for sales and receipt.
	▪ Until 1950, TPS were mainly manual processing, executed by clerks.
	▪ In 1950, early computers were implemented to solve mathematically and scientific problems for business and financial records.
	▪ As time progresses, more advanced technology allowed for more accessible and easier transactions to occur.
	▪ Now to complete transactions, DBMS are equipped with control access and the cilent's application so that it meet's the organisation and the user's needs.
	▪ Things that affected TPS
	  – Universal automatic computer [UNIVAC] was the first commercial computer that allowed for batch processing like job salary payments, and recording consumer's purchases.
	  – Oracle, IBM's DB2 and Microsoft's SQL are software widely used to transaction process.

Students learn to:	Notes:
▪ recognise and describe a transaction	▪ **Transaction is logical unit of work where a multiple of events either completely succeed or entirely fail a transaction.** ▪ **Transaction are modified and generated only when a user initiated relevant data. When the data is modified, it is eventually stored in an information system.** ▪ TPS works by collecting the transaction data can allows for the management of the transaction providing feedback and an indication of the progress in the process or request. ▪ TPS mainly consist of collecting and storing. ▪ When purchasing items at a store, the data of the items and other information are collected at the POS terminal and then stored using an online database. Records are kept on a relational DB and will generate a receipt as proof. ▪ TPS has four main characteristics

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	– Rapid response ➔ Fast performance with rapid response time is critical. Users should not wait for transaction process to respond. The time of when data is inputted to the output must be within a few seconds. – Reliability ➔ Reliability on TPS must be relied heavily. A failure or a breakdown will cause inconvenience and stop business. This leads to economical lose and will affect negative for organisations. Therefore, failure rate must be lowered, and so when TPS does fail, then then quick and accurate recovery can be made. Backup and recovery methods are essential for the reliability of TPS. – Inflexibility ➔ TPS needs to have all transaction to be processed the same way. – Controlled processing ➔ The TPS processing must suit the needs and support the organisations operations. Role, instruction and responsibilities are enforced for employees and TPS to maintain the requirements.
▪ identify, describe and use a batch transaction processing system	▪ **Cheque clearance** ▪ **Invoice generation** ▪ **Credit card transaction**
▪ distinguish between the storage of collected data and the storage of processed data in a batch system	▪
▪ identify, describe and use a real time transaction processing system	▪ **Reservation systems** – **In reservation system, many businesses to put aside a service and product for a customer.** ▪ **Point of sale service** – **This system records items purchased at a cash registers.** – **They allow for calculations and payable value for the customers, where the transaction data is recorded and sent to DB.** – ▪ **Library Loan**
▪ compare and contrast batch and real time transaction processing	▪ **Batch processing with incur more errors and will be cause more issue, whereas real time processing will have less error and encase of a error, it is recorded and fixed much more easily.** ▪ **Batch uses data validation occurs after they have been processed, whereas real time will validate data as they occur.** ▪ **Batch takes the transaction processing as a group, whereas real time uses standalone events, meaning one a time transaction processing.** ▪ **Batch is easier to maintain as it only follows the instruction on the accumulative data, whereas real time is set in the present where data is instantaneous and may require more processing power.** ▪

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▪ analyse an existing transaction processing system to determine its strengths and weaknesses	▪
▪ design and implement procedures for validating entered data	▪
▪ assess the work routine of a clerk in a manual transaction system to determine its suitability for automation	▪
▪ identify participants, data/information and information technology for the given types of transaction processing systems	▪
▪ describe the relationships between participants, data/information and information technology for the given types of transaction processing systems	▪

2. Types of transaction processing systems	
Students learn about:	*Notes:*
▪ web-based	▪ Many businesses will have an online website that allow for customers to interact and initiate transactions and hence enter data. ▪ With a website users, can enter data themselves without the need of a clerk.
• non web-based	▪ **Non web-based uses clerks to enter the data either in paper form or at the point of sale.** ▪ **Some business will have no web presence and hence require physical transactions made.**
▪ on-line real time	▪ **Real time [OLAP] involves the immediate process of data after the event occur.**

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		Usually real-time can be online connections.
▪ batch		▪ Batch requires the accumulating of data [collection of data] and stores them until a scheduled time or when sufficient data has been gather before processing.
▪ systems that appear real time, responding as the transactions occur, but where the actual updating is batch processed, such as credit card transactions		▪ Credit card transaction – real time or batch? – Other example of this case is ATM as participants operate in real time, but in fact operate as batch. – Real time usually online and for credit card transactions, the process in real time only occurs when the card is lost, stolen, cancelled or over the limit. – The remaining of the transaction is the updating stage when the financial and money transfer and calculation for new balances occur. – The transaction take place in batch processing where it could take a few hours to several days to transact. – Also, in the olden days carbon impression of credit cards in paper.

Students learn to:	*Notes:*
▪ for a scenario diagrammatically represent transaction processing using data flow diagrams	▪
▪ distinguish between the different types of transaction processing systems	▪

3. Storing and retrieving in transaction processing systems	
Students learn about:	*Notes:*

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▪ storage of digital data in databases and files	▪ Data for transactions are usually stored in a relational database, but still at time a flat file. ▪ They can be stored as files depending on the data format, how they are processed and updated. ▪ Paper copies are also implemented as a batch processing for daily manual transactions. ▪ Since there are millions of transactions made per day for large organisations, the volume of data become very large and can pose a problem with wanting to updated and handling the database. ▪ To solve this problem actions like periodic and regular downloads of the database into separate databases can be set up as easier management and can be used for further analysis.
▪ retrieval of stored data to conduct further transaction processing such as printing invoices	▪

• data backup and recovery, including:
  – grandfather, father, son
  – off-site storage
  – secure on-site storage
  – full and partial backups
  – recovery testing
  – suitable media
  – specialised backup software
  – transaction logs
  – documenting backup and recovery procedures
  – mirroring
  – rollback
	▪ All computer systems and databases experience failure and break downs due to either the hardware or software corruption.
	▪ The databases management system [DBMS] will contain both backup and recovery methods that both have the capability for quickly and accurately reviving data.
	Data backup and recovery including
	  – Grandfather, father, son
	    ▪ GFS is a backup procedure that refers to three stages or generations of backups in master files.
	    ▪ Son are most recent backup, as that do a partial backup daily.
	    ▪ Father comes next and these do full back up on a weekly basis.
	    ▪ Grandfather is the final generation where a full backup is done monthly.
	    ▪ Since backup are done regularly on the son that will be prone to tear and wear and sometime they eventually be used as father and then grandfather.
	    ▪ Other types of backups like Round Robin, Towers of Hanoi.
	  – Off-site storage
	    ▪ Devices and paper form data can be held in other places and offsite to increase the safety of data from being lost.
	    ▪ Those hardware and files containing data will most like be physical held in a fireproof and waterproof room, where all the backups and data are held.
	  – Secure on-site storage
	    ▪ Data in an TPS can also be held within the site and are kept in multiple computers to ensure that one hardware were to be lost or fail, other may have that copy to resume.
	    ▪ This gives a faster access to back up file than off site storage, but will be more prone to the damages
	    ▪ However, the main disadvantage is due to UPS.

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	− Full and Partial backup ▪ Full backup is a complete copy of all the data accumulated within the system. − It can include everything including the file, operating system, program files, settings and relevant software. This is done so that in case of failure of the system, the backup can still provide a platform for the data to be continued as normal. − This sort of backup can take a lot of time and will require a lot of storage. Hence full backup procedures are can over a weekly basis. ▪ Incremental backup includes making partial backups that copy all files that have changed and been created since the last full backup. − They are a sort of partial backup and a full back up must be made in order to incremental backup to work effectively. − To recover from a stage in the incremental backup, the full backup must be recovered first then the stages of the incremental backup are retrieved until the desired stage. ▪ Differential backup are a copy of the files or data whether they have been edited or not. − − Recovery testing ▪ The purpose of backups is to maintain a safe recovery of data if the system were to fail. ▪ Backup is the process of making a copy of data in case the original is lost or damaged. ▪ Recovery is the process of the backup where the backup copy of the data is restored and placed back into the system. ▪ The main types of recovery testing considered: − Backup − Journal/Record − Checkpoint − Recovery manager ▪ To test the recovery process, a test where a few files are restored into a temporary directory. Having a temporary directory means that the original data won't be affected. − Suitable media ▪ Magnetic tape − Magnetic tape is a sequential access media contained within cassettes or cartridges and is the most effective and convenient media for backup of large quantity of data. − They are portable and inexpensive and will virtually store large mass of data. − The only down side to magnetic tapes are that they use sequential access meaning that retrieval data will be relatively slow. However, this is suitable for backup. ▪ Hard disks

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	– Hard disk are a more modern hardware used to backup and a faster way to access the recovery files. – External hard disks devices can be accessed through connection to a power with USB, c type cables and fire wire ports. – They are generally more expensive than magnetic tapes but will provide more security. – They are generally used for off-site backup storage. – Mirrored RAIDS uses multiple hard disks to store copies of data. ■ CD/DVD – Compact Disc and Digit Versatile Disc are generally cheaper and an optical media of backup storage. – This low-cost solution to backup may be ineffective as they only allow for some amount of data to be stored. ■ Online System / Cloud – An emerging trend to storing data to backup is using the cloud or a virtual storage. – The internet can specialise in providing online backups and recoveries for individuals and business. – They do not need physical devices and will provide unlimited storage. Additionally with there virtual storage, the data doesn't have to worry about the damages and problems. – Having online system can possible mean remote location can obtain access to such data. – Specialised backup software ■ There is specialised backup software can be used to back up and manage the procedures. ■ They are designed to manage the copying of selected files to backup media and offer an automated scheduling of any type of backups, compressing files and creating reports. – Transaction log ■ Transaction logs contain historical details of each transaction performed including details of the transactions that are currently been processed. ■ These historical events can be used to restore a transaction process and other – Documenting backup and recovery procedures ■ A journal/ checkpoint or a record is file that keeps track of all the backup scheduled and will be scheduled and provide comments and feedback about the process. ■ If a recovery were to occur the file is also noted. – Mirroring ■ There are two type of RAID in a database server. ■ Striping RAID devices are used to improve data access speed. ■ Mirrored RAID devices is used to store the transaction log for all databases. This means all the remaining hard drives will contain a complete copy of the transaction log. – Rollback

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	- Rollback occurs when a transaction is unsuccessful. Hence is aborted or recorded on an error log. - When errors occur in transaction system like a fault or failure. The to recover the disaster, it must be shut down and be replaced with a new drive controller and the server must restart. This means all transactions has been abort (rollback).
- updating in batch systems: – historical significance – limitations of batch processing – technology required – steps in a batch update – suitable applications	▪
- updating in on-line real time systems: – relevance and impact – technology required – hardware requirements – large secondary storage – software requirements (on-line database) with user friendly interface – steps in on-line real time processing – suitable applications	▪

Students learn to:	*Notes:*
▪ store digital data in databases and other files in such a way that it can be retrieved, modified and further processed	▪
• implement systems to store paper transactions	▪

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• select and apply backup and recovery procedures to protect data	▪
▪ document, including diagrammatical representations, the steps in batch processing	▪
▪ document, including diagrammatical representations, steps in real time transaction processing	▪
▪ identify systems for which batch is appropriate and is not appropriate	▪
▪ distinguish between on-line real time and batch systems	▪
▪ create and use a transaction processing system	▪

4. other information processes in transaction processing systems	
Students learn about:	*Notes:*

• collecting in transaction processing:
   – hardware
   – collection from forms
   – screen design for on-line data collection
	▪ *Collecting an information process that enters data into a transaction process.*
	▪ *Example it people using an ATM to generate transaction data by entering their pin, debit card and typing requests.*
	   – *Hardware*
	     ▪ *MICR for reading cheques*
	       – *Magnetic ink character recognition (MICR) are used in cheque for high speed collection of cheque base data.*
	       – *Mainly used in banks to read account numbers on cheques.*

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– web forms for transaction processing (real time and batch)	– *The ink toner is used to print specific characters. The ink contain ferromagnetic material and hence if the account number has written over it, then the reader can still easier identify the account number.*
	– *Two main types of MICR technology*
	  ■ *Waveform: Requires the magnetisation of the MICR lines and passes it to the read head. Where the read head will convert the magnetic data into small electrical signal. Each MICR character is encoded with a unique signal and therefore upon the reader decoding the signals they can convert back to the corresponding digital code.*
	  ■ *Matrix: A high speed MICR reader to read slices made within the MICR characters. As the reader reads the character, it results in a mini bitmap of each characters and determines the magnetised slices. This then allows them to convert them into the designated code.*
	■ *ATM*
	  – *Automatic Telling Machine (ATM) is a banking terminal that allows for deposits and withdrawals.*
	  – *They can be access in any time of the day and participant entering data will be processing real time transaction.*
	  – *Upon the collection of sufficient data to verify the user, they are connected to the bank's central and transaction can be requested.*
	■ *Barcode readers*
	  – *In the retail industries, barcode readers are used extensively to collect product's information at a point of sale.*
	  – *They operate through reflecting light off the barcode image, where scanners read and determine the black lines. Light can be reflected well through white but not on black, hence are able to read from left to right and use to strip of reflected lights to determine the information.*
	  – *All these product's information is held on a central computer linked to the POS terminal.*
	– *Collection from forms*
	■ *Forms are a paper based document used to collect data from a person.*
	■ *When forms are manually completed the forms are entered into a system and subsequently batch processed at a later time.*
	■ *Modern day forms are web based allowing for user interface and purposely guide user through the data. They increase the accuracy and efficiency of data entered*
	■ *Data validation must be used for forms to be reliable and accurate. On web base, input mask and data type are implemented to restrict other unnecessary data input. On paper base, data validation can be improved through the design of options and restricting the length of data.*
	■ *Three main collection of Forms: Paper, On-line and Web base.*
	– *Screen design for on-line data collection*
	■ *General design for all forms:*
	  – *Know who the users are so appropriate data requests and question can be made. It should be clear and understandable for the known users.*

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	– *Identify the precise nature of all data items that will be collected. Knowing the questions and the type of data input might help in relevant and sufficient forms.* – *Consistency with other forms and applications. Default options should be made. Examples are options should be circular, tick box should be square.* – *Form components should be readable.* – *Forms should include significant areas of white space to visually imply grouping or simply to rest the eyes.* ▪ *On-line forms don't always require an internet connection. On-line forms are simply available in network whether, they are intranet, extranet or internet.* ▪ *For on-line screen forms* – *Clearly show what functions are available. Users will like to explore new interface. Hence relevant input function should not be hidden and dull.* – *Every action by a user should cause a reaction in the user interface. Known as a feedback, this allows for user to identify if an entered data is wrong, or simply know their progress to where they are at. It also determines if something is occurring or has occurred. Having a feedback allows users to feel more secure and believe that the form is still operational.* – *Users action that perform potentially dangerous changes should provide a way out. Forms and other software are equipped with undo buttons whilst other have a warning message to inform users about their input and actions. They then can revert or reverse their action.* – *Web forms for transaction processing (real time and batch)* ▪ *This refers to the internet and the world-wide web where everyone can access the form.* ▪ *For web forms* – *The speed of individual users' internet connection. The internet connection speed is unknown and can drop at any given time. Therefore, web base forms should be make downloadable and should be aimed to reduce the amount of data transferred. Feedback should be provided.* – *Designing a form such that transmission of data required validation prior to the next form that is required for display. Web bases forms should validate all input fields together after a submit button is click.* – *The consideration of hardware and software. Software in general may require updating and ensure that they are compatible when accessing web base forms online. Screen resolutions.* – *Users are able to set their own preference within web pages. Meaning that for their specific web browser they are able to change the need of the design to suit the browser.* – *Security and personal and other detail is critical when using web base forms. Transaction forms must be encrypted and decrypted to ensure a safe transmission of data. Other security measures must be taken in account to allow users to feel a*

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	sense of confident when entering their details. Example, Having the SSL protocol and providing padlocks and antivirus and cyberattack software can enable a safer environment.

• analysing data, in which output from transaction processing is input to different types of information systems, such as:
   – decision support
   – management information systems
   – data warehousing systems (for data mining)
   – enterprise systems
	▪ *The output of data in transaction processing are stored in a database and can be analysed in many ways to improve the organisation's performances.*
	▪ *The output of transaction data can be the input data for another information system like*
	  – *Decision Support*
	    ▪ *Decision support system [DSS], provides information for managers to assist in making decision. Note that the system doesn't decide the results and option, but merely provide advantages and disadvantages to allow managers to easier choose.*
	    ▪ *Business uses TPS to process sale transactions for the databases, as the DSS is a tool that analyse and summarises the data to suit the decisions and present possible solutions. These analyses are stored as spreadsheets and held as trends and patterns about the users' purchase, data and region.*
	  – *Management Information Systems*
	    ▪ *Management Information Systems [MIS] provide information for the organisation's managers.*
	    ▪ *MIS are used to generate reports on specific sales, trend, payrolls, stock inventory, orders and budget.*
	    ▪ *Examples of the reports MIS generates:*
	      – *A list of each product a factory produces together with the profits and loss made over a 12 months' period.*
	      – *A table listing each salesperson together with the total monthly values of their sales.*
	      – *A column graph displaying the sick days taken by all employees.*
	      – *A line graph of all the product sold.*
	  – *Data Warehousing Systems (for data mining)*
	    ▪ *Data warehouse is a large database that includes historical copies of each organisation's operational databases.*
	    ▪ *Most data are static and read only meaning they mainly acts as historical records for all transaction and sale within the organisations.*
	    ▪ *They are not affected by the process and examination of other software that analysis the performance of the organisation.*
	    ▪ *Data warehouse will have stored historical information for the creation of the organisation, and hence when new data is entered and stored, the format are kept similar. These common formats will be convenient for examine analytical process.*
	    ▪ *Data mining is the process where it finds emerging trends and relationships in the data warehouse. It then turns these trends into interesting and useful resources to often help decision support [DSS] or basic management [MIS].*
	  – *Enterprise System*
	    ▪ *Enterprise systems are only often used in large business, universities a large corporation.*

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	▪ *Basically, these systems include critical hardware, critical software and applications and critical data. They perform processes central to the overall operations of an enterprise.*

Students learn to:	*Notes:*
▪ describe the operation of relevant hardware and how each is used to collect data for transaction processing	▪
▪ design and justify paper forms to collect data for batch processing	▪
▪ design user friendly screens for on-line data collection	▪
▪ identify existing procedures that may provide data for transaction processing	▪
▪ create user interfaces for on-line real time and batch updating, and distinguish between them	▪
▪ identify situations where data warehousing and data mining would be an advantage	▪

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5. issues related to transaction processing systems	
Students learn about:	*Notes:*

• changing nature of work and the effect on participants, including:
  – the automation of jobs once performed by clerks
  – shifting of workload from clerks to members of the public
	▪ TPS are changing the nature of work for many people. They essentially automate business operational and hence affect jobs and the influence people who perform these operations. They can be seem to overtake jobs at increasing rate due to their ability to transaction hundreds of sales within seconds.
	  – The automation of jobs once performed by clerks
	    ▪ The changing nature of work is significant affect people who perform transaction and operations with machines and TPS.
	    ▪ Automation of jobs refers to the use of information technology to perform tasks once performed by humans. Example ➔ POS terminal with clerks performing manual transactions are been replaced with self-services machines.
	    ▪ Clerks have been drastically effect through the TPS, as computer-based system have taken over a lot of transaction operating jobs.
	  – Shifting of workload from clerks to member of the public
	    ▪ The statement is very true as self-service machines and computer-based system had changed clerk's jobs and deem them useless. These machines can perform hundreds of transactions and operational in a matter of seconds. Clerk on the other hand will have to manually take time to search and process transactions.
	    ▪ People of the public or from the environment will thus become participant, entering and processing data by themselves. ATM and self-service machines, auto pay, online transaction, can all now be done by the public instead of requiring a clerk.

▪ the need for alternative procedures to deal with transactions when the TPS is not available	▪ Large organisation will found computer based system immensely beneficial for TPS. ▪ Hence if the computers and servers were to fail and be unavailable, it would cause a huge disruptions and economical loss. ▪ Recovery of the data means the replacement of hardware, rebuilding the system and restarting/restoring the data. This is very time inefficient meaning a non-computer base solution must be implemented. ▪ Paper base are the only solution to non-computer base procedures and can operate in real time. ▪ These papers based alternatives should be trails and tested regularly to ensure that all staffs and employees can capable to manually understand the paper bases transaction process system. ▪ need for these procedures to evolve as the situation changes over time. Alternative procedures need to be able to cater to any system change, hence the need for periodical testing.
• bias in data collection:	▪ It is important that data is free from bias.

Peter Tran

– when establishing the system and deciding what data to collect
– when collecting data
	▪ Bias data results in to inaccurate information for the system. They are unfairly skewed and have negative impacts on the output for the system.
	  – When establishing the system, and deciding what data to collect.
	    ▪ When deciding to collect, data can present a bias attitude.
	    ▪ Often incomplete data can be collected for the sack of simplify the system.
	    ▪ People and employees can manipulate data and adjust their income to suit their expenses. This is biased for other employees and provide disadvantages and unfavourable outcomes.
	  – When collecting data
	    ▪ When collecting, or identifying data, is another area for bias to occur.
	    ▪ Surveys over the internet is a perfect example where bias can occur. The surveys sent can directly target a specific age group and certain criteria and hence rig the survey.
	    ▪ Result will have a one sided chart and graph.

• the importance of data in transaction processing, including:
– data security
– data integrity
– data quality
	▪ All organisation will need to relies on TPS and the data processed. IT is important for organisation to have procedure in place to ensure that data is secure, accurate and valid.
	  – Data security
	    ▪ Data security involves a series of safeguard to protect the data.
	    ▪ Strategies to increase the security of data
	      – Username/Password
	      – Physical barriers
	      – Backup copies
	      – Anti-virus software
	      – Firewall
	      – Data encryption
	      – Audit trails
	  – Data integrity
	    ▪ Data integrity is the reliability of data
	    ▪ Strategies
	      – Data validation
	      – Data verification
	      – Data integrity
	      – ACID properties

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	– Minimising data redundancy – Data quality ▪ Data integrity is about the accuracy of the data.

▪ control in transaction processing and the implications it has for participants in the system	▪ Control in TPS
	    – Controlling TPS consists the collection and manipulation data.
	▪ Controlling transaction processing starts with collecting and includes the way the TPS manipulates the data and the way errors are corrected. Data preparation and authorisation create the transaction data that will be entered in a TPS. People shouldn't become completely dependant on a TPS. They need to maintain control over their organisations operations
	Control in transaction processing and the implications it has for participants in the system – control is critical because the volume of data is immense in TPS and people only see parts of the operation. Thus errors and problems and occur frequently, though not be noticed, if control measures aren't adhered to. Management shouldn't depend solely on the output of TPS but to make decisions and plans incorporating outputs form both management information and decision support systems. Effectiveness of system participants can be automatically monitored like the time spent away from desk, time spent on the Internet etc. This monitoring is the result of the aim to control a TPS and can be used to intimidate workers and increase stress levels and treats workers more like machines than humans
	    – A metaprogram used to control the operation of TPS.
	    – TPS must support an organisation's operations. It must enforce allocated roles and jobs etc.

▪ current and emerging trends in transaction processing	▪ Emerging Trends –

Students learn to:	*Notes:*
▪ assess the impact on participants involved in transaction processing	▪ **Participants** are the people who conduct the actual information processing. **Participants –** are people who conduct the info processing. They are people who do the work. Success or failure of the system depends on them. **People –** from environment are becoming participants in real time processing systems as they directly enter transactions and perform validation. ▪

Peter Tran

▪ identify jobs that have changed and/or jobs that have been created as a result of transaction processing, and report on the implications of these changes for participants in the system	▪
▪ discuss alternatives for when the transaction processing system is not available and explain why they need to be periodically tested	▪
▪ identify security, bias and accuracy problems that could arise from the actions of participants	▪
▪ recognise the significance of data quality	▪

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