

Characteristics of Transaction Processing Systems

- Directly support business Information systems
- E.g.: (EFTPOS)- connected central computer

Transaction	Logical Unit of Work
Process	An event that converts data from one state to another
Point-of-Sale System (POS)	A System for selling goods or services through the use of electronic funds transfer. Every Sale using a point of sale system imitates transaction processing

Real-time transaction processing systems	
	<p>Fast response times. The turnaround time for each transaction for a user to receive a response should be minimal and acceptable, even at peak use times.</p> <p>Reliability with zero or minimal downtime. Transaction processing systems have invaded all areas of commerce. If the system is not operational for whatever reason, sales and hence revenues will be lost. People have become used to shopping without cash and the sudden unavailability of this service would pose problems that would affect many commercial transactions.</p>
Batch transaction processing systems	<p>Consistency and inflexibility. Each and every transaction needs to be processed in a consistent manner all the time. Transaction processing systems are inflexible. There is only one way of processing any given transaction. Any transaction from any source will be processed the same way.</p> <p>Controlled processing. This means that the processes within a transaction processing system must be aligned with an organisation's internal structures. The transaction processing system should enforce these structures and responsibilities.</p>

Real-Time Processing

Real Time Processing	Processing of Transaction as they occur, in real time
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- Real Time Processing Requires
 - transaction - processes immediately as soon its received
 - instant confirmation - that transaction has been completed
 - Online database for immediately
- Involves
 - Network terminals - users place request
 - Specialised computers at other end - deal with request
 - Many clients at one time

- Examples
 - Medical insurance
 - Finance
 - Retail
 - Banking
 - Airlines
- To be effective, has two characteristics
 - Concurrency
 - Atomicity

Concurrency

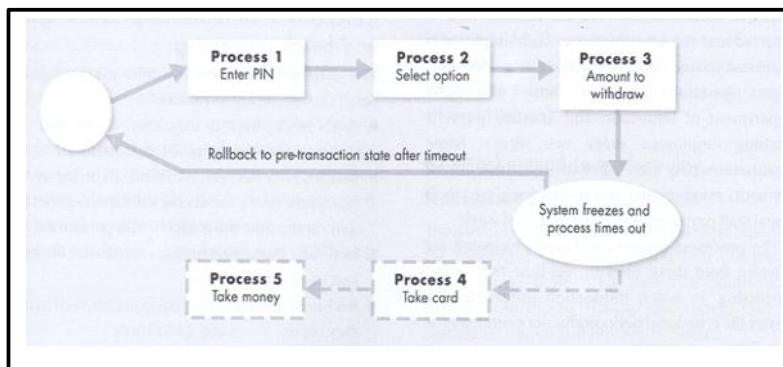
Concurrency	Feature preventing more than one user from having write access to a record at any one time
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- Two or more users cannot change same data at same time
- One user at a time
- Second user - locked and inaccessible
- If simultaneous granted
 - Second user: read only

Atomicity

Atomicity	Feature possessed by a transaction in which all of the processes involved in that transaction are regarded as single process
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- Transaction seen - single event
- Consist of multiple processes - group
- One transaction fails - all fail (abandoned)
 - Rolls Back - Pre Transaction State
- All processes completed
- System - post transaction
- Successful transaction



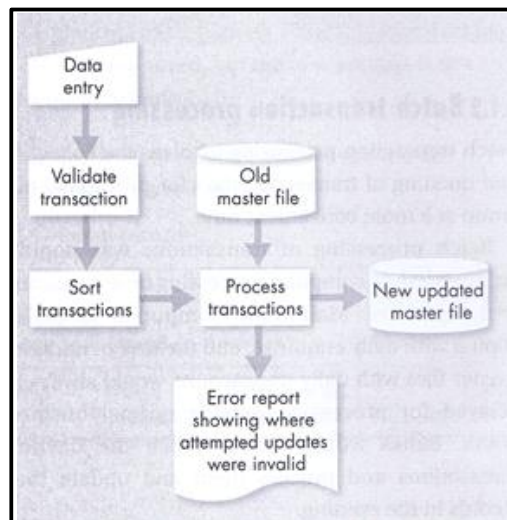
Transaction Processing Monitoring Software

- To manage processes part of transaction - ensure efficiency
- Referred to a middle ware
- Checks to determine resources - for forthcoming processes
- Delays occur if not sufficient resources

Batch Transaction Processing

Batch Transaction Processing	Queuing of transactions for later processing as a group of batch
Sequential	Following on after another, sequence or line
Master File	The file that stores the end results of a set of transactions
Unique	Not replicated - there is only one copy

- Involves the collection & Queuing of transaction data in groups - at convenient time
- Popular years ago - CPU processing time - expensive to run
- Processing master file updated periodically - not continually (real time)
- For batch processing
 - Transaction file contains all changes that need to be made to master file
- Before file is matched - transaction file stored in sequential order - amend key field as master file
 - Allowed two files to be matched and new updated master file to be created



Comparison of Real Time Processing & Batch Processing

<u>Real Time</u>	<u>Batch</u>
Incurs less errors	Incurs more errors
Updates file part of transaction	Transactions Batched After event
Validated as they occur	Validated After
Each transaction - standalone event	Transactions seen as group

- Some computer system combine both - use where most cost effective
- Real Time Processing - Banks recording cash in withdrawal
- Batch Processing - Printing of Financial Statements

Data Validation

- Critically important
- Invalid data received & accepted - consequences unpredictable
- System - not allowed to produce false results

VERIFYING DATA

Data validation may be achieved by verifying data as it enters the system.

Verification of data is aided by:

- restricting the number of characters in each field, e.g. 4 characters only (XXXX)
- restricting the data type that can be accepted, e.g. numeric (9999)
- restricting the range of values that can be accepted values (greater than 0 and less than 6)
- imposing other conditions such as 'delivery date must be later than order date'
- lookup values from a list.

Background to Modern-Day Transaction Processing Systems

Data Validation	The Checking of Data to make sure the data is acceptable
Manual Transaction Processing	Processing method that uses human labour rather than automated processes to carry out required tasks
Passbook	A Bankbook held by a customer that lists past transactions and current balances

Step	Manual transaction system	Automated transaction system
1	Customer goes to the bank with passbook	Customer goes to the automatic teller machine (ATM) with debit/credit card
2	Customer presents the passbook	Customer enters PIN
3	Teller accepts person's identity as valid	ATM accepts PIN as valid
4	Customer presents to the teller a withdrawal slip for an amount of cash	Customer enters transaction type and amount to be withdrawn
5	Teller checks whether there is enough money in account for withdrawal	Computer checks whether there is enough money in account for withdrawal
6	Teller subtracts the amount from the total balance in the customer's passbook	The computer subtracts the amount from the customer's account balance
7	The withdrawal slip is piled in with other withdrawal slips for batch processing and updating master records later in the day	If transactions are made after a certain time of day or evening, they are batched for processing and updating master records the next day
8	Teller asks the customer what denominations are desired for the money	Computer asks the customer what denominations are desired for the money
9	Cash is handed to the customer	Cash is presented to the customer
10	Record of transaction is in customer's passbook	Transaction details are stored on a file at the bank

Examples of Transaction Processing Systems

People who Interact with Transaction Processing Systems

- Users of the Information System
 - Belongs to same organization
 - People who own organization (participants)
- Participants
 - Conduct processing
 - System depends on participants - for efficiency and viability
- People from the External Environment
 - Temporary Participants
 - Use system as normal activities
 - Conduct
 - Transactions
 - Withdrawing
 - Depositing
 - Transferring Money

Examples of Real-Time Transaction Processing

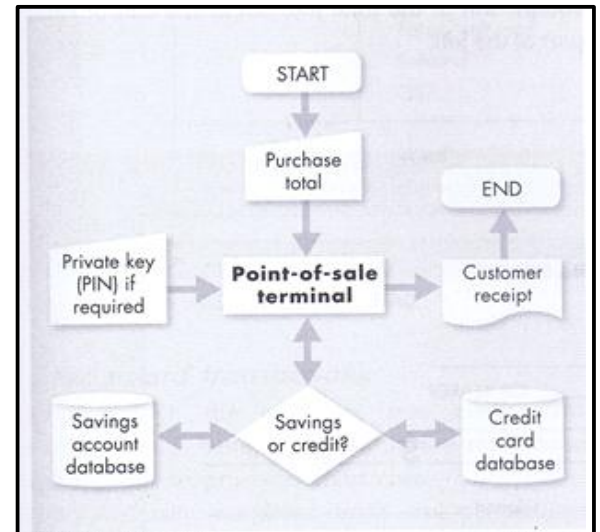
Users	People who use the transaction processing system to access data and analyse data as part of their role within organization
Participants	People who conduct the information processing, such as IT staff
People for Environment	People who use transaction processing systems, such as bank customers

Reservation Systems

- Accessed by members of organization
- Used in:
 - Travel Agencies
 - Hotels
 - Clubs
- Upkeep required
- Able to process in real time - immediate response
 - I.e.. check seats on flight
- Must be able to:
 - Answer customer enquiries as to service availability
 - Activate the reservation on the customers arrivals
 - Confirm / Cancel / Place reservation

Point Of Sale Service

- Used by retailers - enable customer purchases without cash
 - Sale amount calculated and entered into POS terminal
 - Full amount entered - transaction entered
 - Transaction system performs security checks and codes
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- Devices connected to modem
 - Sign or pin entered
 - Usually connected:
 - Cash register
 - Barcode Scanner
 - Direct Debit - EFTPOS



Library Loans

- Members issue with card
 - Cars barcoded with ID
 - Entrance ID confirmed
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- Borrowed items - marked as ON LOAN
 - Booked for period of time

Examples of Batch Processing

Cheques Clearance

- Written (Drawn) by individual or organization (payer)
- Written promise to pay
- Before funds transferred - cheques cleared
- Checks used to :
 - Enough funds to transfer
- Batched by bank

Invoice Generation

- Generated in batches
- I.e.. Telstra, Sydney Water etc. - quarterly, monthly
- Allows organizations to manage both commuter resources and employee time efficiency

Credit Card Transaction

- Transactions processed in batched - appear to be real time
- Credit Card sales conducted at POS terminal - update carried out ob. batched credit card transactions at later time

Storage and Retrieval in Transaction Processing Systems

Master File	The file that stores the end results of a set of transactions
Transaction File	A log of all the transactions that took place during a period of time
Report File	S formatted Report presented to an authority requesting it
Work File	A Temporary file for work in progress, created by the system
Program File	The Executable file that drives the application or system programs
Software Program	Engine or backbone of the transaction processing system. Instructions for processing data

Data Warehousing

Data Warehousing	Electronic collection of raw data from variety of sources and subsequent storage requirements
Data Mining	Process of searching through databases for known and unknown data patterns

- Database for storage of raw data that is electronically collected from variety of sources
- I.e. EFTPOS, Credit card transactions - forwarded to database
- Details include:
 - Time
 - Date
 - Amount transferred
 - Location
- Type of data may be specialize
- Warehouses set up to collect 24/7
- Ownership / Control - hands of parties who collect or directly purchase it

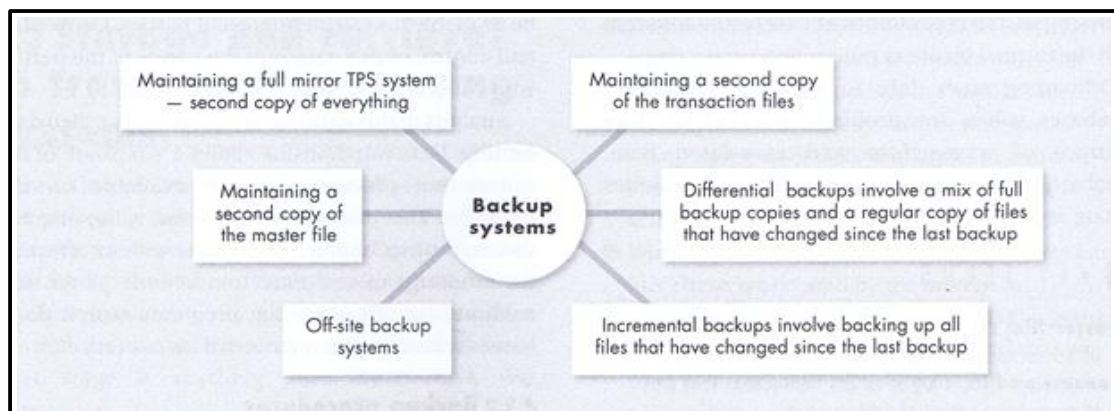
- Data Mining - Analysis of this data
- Warehousing allows snapshot of transaction processing - available on database
- Data analyse for ongoing data mining techniques

Backup Procedures

Backup Procedures | Procedures used to back up data in case of future system failure

- Essential in operation where data is critical
- Best way to institute a backup - build redundancy
 - Duplicating / Hard copy
 - Off site storage - disaster strikes

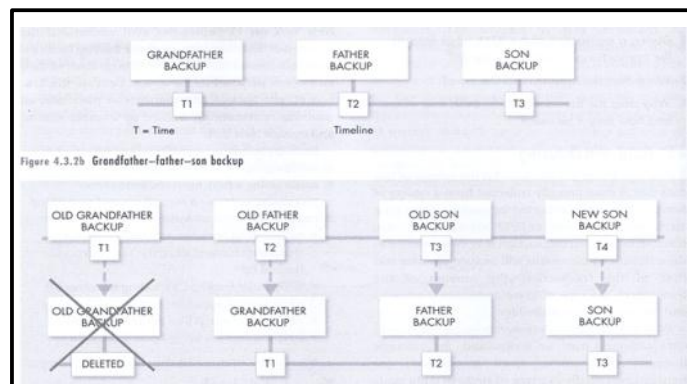
- Backup procedures include
 - Maintaining off site backup systems
 - Maintaining fully mirrored transaction
 - Institution partial backups
 - Incremental backups
 - Differentials backups
 - Only transactional files backup
 - Only Master files backup



Grandfather - Father - Son Backups

- Requires three successive generations of full master file backup
- Number of successive backups kept - depends on value of these backup
- Three copies are kept

T4 backup is taken
 T2 Becomes T1
 T3 becomes T2
 T4 becomes T3



Backup Hardware

- Anything which data can be stored
- Backup on digital devices - depends on file size
- Examples include:
 - CD -RW
 - DVD-RW
 - Hard Disk
 - Zip
 - Jazz Disk
 - Magnetic Tape
- Tape Backup
 - Common in business Organisations / large institutions
 - New tape - fast data rates
 - Compact / easy to transport
 - Set up using Specialised Backups Software

System Recovery Processes

- Reasons why failure Occur are:
 - Fire / Water Damage
 - Data transmission / Reception failure
 - Virus
 - Human Error
 - Invalid data entry
 - Natural disasters
 - Sabotage
 - Vandalism
- Simplest recovery process to restore data last backup up - new replacement
- Backups of intermediate transaction limit amount of data lost between recent backups and later transactions

Manual Backup Recovery Systems

- Organisations must have manual - fail safe
- Replace Automated systems when automation down
- Slower than automated - however - has redundancy
- Internet fund transfer service down
 - Manual letter authorization - 24hours - still operational

Backup Recovery

- Transaction in progress time in failure
- Transaction roll back
- No processing occurred in terms of output a solution

Forward Recovery

- Starts at the last backup copy
- Reprocesses transaction file until system failure
- Egg. Word processor function - saves temporary document of file
- If word processor fails - copy at last recoverable state (usually original)
- If word processor fails with function on - last backup

Updating in a Bunch

- All batch processing transactions collected in a batch
- Data must be sorted in sine for move sequential order
- Master file stored on separate master file tape
- Updating master fuel involves additions, updates, deletions
- Occurring error invalidates whole batch - leads to rejection
- Batch processing interfaces - designed for operating personnel

Updating in Real Time

- Software needs to be online
- User friendly interface
- Instructions should be clear, efficient, precise
- Time taken to respond to user input - critical
 - Needs to be short During peak periods

Other Information Processes Relevant to Transaction Processing Systems

Collection Methods

Decision Support Systems	Systems that assist users in making a decision
Management Information System	Reporting systems for the use of managerial staff

Data Collection Using Hardware

- Barcode Readers
- Automatic Teller Machines (ATM)
- Magnetic Ink Character Recognition (MICR)

Collection From Forms

- Traditional method
- Form layout should mirror data entry screen
- Form design could include text boxes and grouping with borders

Screen Design for Online Data Collection and Web Forms

- Designed for data entry
- Distinguished from web forms
- Both types may be batch or real time processed
- Online forms minimise data entry requirements, features include:
 - Pull down buttons
 - Radio buttons
 - Check boxes
- Form should include data entry validation

Analysing Data

- Data that is output for transaction processing is input to information systems

Information Systems

- Decision Support Systems

DSS	Systems that assist users in making in decision
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- Takes data (usually from TPS, MIS & external sources) to assist in decision making
- Provides analysis tools, information & models
- E.g. in statistical analysis, stock market, trade figures
- Expert System:
 - Part of decision support system
 - Knowledge base and rules of inference
 - Same conclusion as human

- Management Information Systems

MIS	Reporting Systems for the use of managerial staff
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- Takes data & organises it - information reports (usually from TPS)
- Provides information on the performance of an organisation
- E.g. Execute information systems (EIS) – strategic issues

Issues Relating To Transaction Processing Systems

Employment Trends and The Nature of Work

- Manual Transaction Processing
 - White collar industry employing school leavers
 - Labour force - huge
 - Requirements for labour force was huge
- Major change - employment trends since the introduction of TPS
 - Decline in demand for clerical staff
 - Increase in IT / Technical staff

Social Issues

- Automated systems - note for whole public
- PIN for ATM - can be witnessed (nearby observers)
- Security guards required for ATM's
- Hidden Key Logger Software

The Importance of Data In Transaction Processing

Data Bias

- Data needs to be free from bias
- TPS data possibly bias
- Presentation of data - shows bias
- Data entry individual causes bias - depending how data inputted

Data Security

- Paramount to ensure - not intentionally / intentionally modified, destroyed copied etc.
- Access to data needs to be protected
 - Use of login
 - Password Restrictions
 - Biometric devices
 - Encryption
 - Firewalls

Data Accuracy

- Data must be checked and source of data verified
- Cyclical redundancy - ensure degree of accuracy data not corrupted or modified
- Validation / Verification assist in maintaining data accuracy

Data Integrity

- Refers to reliability of data
- ACID (Atomicity, Consistency, Isolation, Durability) test applied to transactions
 - Determines integrity
 - Atomicity
 - Criterion requires all steps in transaction to be completed
 - Any part of transaction failed - system rolls back to pre-transaction state
 - Consistency

Consistency	The requirement that each transactions perform the same process each time in the same way
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- Each transaction perform same process consistently
- Consistently transforms from one state to another

- Isolation

Isolation	The Requirement that no two transaction are to interfere with each others database updates
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- Transactions occur in isolation from every other transaction
- No two transactions interfere with each other databases updates
- Enforced by file / record locking
- One user have access to record at any one time
- No two simultaneous transactions are to have WRITE ENABLED access at same time to a specific records
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- Durability

Durability	Requirement that is satisfied when all the changes that transaction has made to the database becomes permanent upon finalization
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- Criterion satisfied when transaction is committed (finalized) and transactions made permanent

Control in Transaction Processing

- Control measures need to be in place to ensure errors and problems do not occur
- Measures incorporated to ensure that the data generated by system is factual and a true representation of the situation
- Authorities - maintain access to independent sources
- Manual Backup Systems
 - Ensure ongoing viability of organization
 - Periodic testing