

PAPER – 6 : MANAGEMENT INFORMATION AND CONTROL SYSTEMS

Answer all the five questions.

Question 1

- (a) Explain the terms “system stress” and “system change”.
- (b) Briefly describe the components of transaction processing system.
- (c) Explain the effect of applying Computer technology to information system.
- (d) What are the objectives of the inventory control applications? (5+5+7+3= 20 Marks)

Answer

- (a) System stress and system change: Systems, whether they be living or artificial systems, organisational systems, information systems, or systems of controls, change because they undergo stress. A stress is a force transmitted by a system's supra-system that causes a system to change so that the supra system can better achieve its goals. In trying to accommodate the stress, the system may impose stress on its subsystems and so on. There are two basic forms of stresses which can be imposed on a system separately or concurrently namely:

- (1) A change in the goal set of the system. New goals may be created or old goals may be eliminated.
- (2) A change in the achievement levels desired for existing goals. The level of desired achievement may be increased or decreased.

When a supra-system exerts stress on a system, the system will change to accommodate the stress or it will become pathological i.e., it will decay and terminate when there is a change, it can be structural change or process change.

For example, the goal set for a computer system may change if a requirement is imposed by management (the supra-system) for system data to be shared among multiple users rather than be available only to a single user.

- (b) Components of transaction processing system: The principal components of a transaction processing system include inputs, processing, storage, and outputs. These components or elements are part of both manual and computerized systems. The major components of a transaction processing system are:
 - (i) Inputs: These are source documents such as customer orders, sales slips, invoices and purchase orders etc. Source documents, such as customer orders, sales slips, invoices, purchase orders, and employee time cards, are the physical evidence of inputs into the transaction processing system. They serve several purposes:
 - Capture data
 - Facilitate operations by communicating data and authorising another operation in the process

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- Standardize operations by indicating what data require recording and what actions need to be taken
 - Provide a permanent file for future analysis, if the documents are retained.
 - Source documents are typically forms carefully designed for ease of use and accurate data capture.
- (ii) Processing: This involves use of journals and registers to provide a permanent and chronological record of inputs. Some special journals e.g. sales journal, purchase journal etc are also used. Processing involves the use of journals and registers to provide a permanent and chronological record of inputs. The entries are done either by hand in simple manual systems (journalised) or by a data entry operator using a PC. Journals are used to record financial accounting transactions, and registers are used to record other types of data not directly related to accounting.
- (iii) Storage: Ledgers and files provide storage of data. All accounting transactions must be reflected in the general ledger. It generates a trial balance to test the accuracy of the entire record prior to record keeping. Ledgers and files provide storage of data in both manual and computerized systems. The general ledger, the accounts/ vouchers payable ledger, and the accounts receivable ledger are the records of financial account. They provide a summary of a firm's financial accounting transactions. All accounting transactions must be reflected in the general ledger. A debit –credit entry is input for every transaction. Traditionally, this process has been called posting. The general ledger generates a trial balance to test the accuracy of the entire prior record keeping.
- (iv) Computer Processing: Processing converts data into information. A ledger may be processed to generate a listing of transactions; or to generate financial statements etc. When computers are used for processing, two different modes of processing accounting transactions are possible. These modes are batch processing and direct processing. Batch processing is conceptually very similar to a traditional manual accounting system. Batches of transactions are accumulated as a transaction file. Transaction files are printed to provide documentation of inputs to the accounting system. Transaction files are subsequently posted to ledgers by computer programs. The ledgers are then periodically processed to generate financial statements. The flow of processing in a batch processing computer system is essentially same as in a traditional manual system- source documents to journals (transaction files), journal to ledgers, and ledgers to financial statements.
- (v) Outputs: Any document generated in a system is an output. It can be both an output as well as an input. Some of the outputs are trial balance, financial reports, pay cheques etc. There is a wide variety of outputs from a transaction processing system. Any document generated in the system is an output. Some documents are both output and input (e.g., a customer invoice is an output from the order-entry application system and also an input document to the customer). Other common outputs of a transaction processing system are the trial balance, financial reports, operational reports, pay cheques, and voucher cheques (payments to vendors).

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- (c) Effect of applying Computer technology to information system: The computer technology applied to information system will effect the information system in following ways:
- (i) Speed of processing and retrieval of data increases: Manual systems, howsoever well organised, often fail to match the demand for information for decision making. Computers with its unbelievably fast computational capability and systematic storage of information with random access facility provide relevant information with minimum loss of time.
 - (ii) Scope of use of information system has expanded: The importance and utility of information system in business organisations is realised by most of the concerns, especially after the induction of computers for MIS development. Systems experts in business organisations developed areas and functions, where computerised MIS could be used to improve the working of the concern. This type of applications hitherto is not feasible under the manual system. It is now possible to use an on-line real-time system to provide information to various users sitting at a remote distance from a centrally located computer system.
 - (iii) Scope of analysis widened: The use of computers can provide multiple type of information accurately and in no time to decision makers. Information provided by a computer equips an executive to carry out a thorough analysis of the problems and to arrive at the final decision.
 - (iv) Complexity of system design and operation increased: The need for highly processed and sophisticated information based on multitudes of variables has made the designing of the system quite complex.
 - (v) Integrates the working of different information sub-system: A suitable structure of management information system may be a federation of information sub-system, viz., production, material, marketing, finance, engineering and personnel. Each of these sub-systems is required to provide information to support operational control, management control and strategic planning. Such information may be made available from a common-data-base. The common data base meets out the information requirements of different information subsystems by utilizing the services of computers for storing, analyzing and providing the information.
 - (vi) Increase the effectiveness of information systems: Prior to the use of computer technology for information purposes, it was difficult to provide the relevant information to business executives in time even after incurring huge expenses. The use of computer technology has overcome this problem. It is now possible to provide timely, accurate and desired information for the purpose of decision making.
 - (vii) More comprehensive information: The use of computer for MIS enabled systems provides more comprehensive information to executives on business matters.

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- (d) Objectives of the inventory control applications: The objectives of the inventory control applications are:
- (i) To provide high quality service to customers by utilizing fast; accurate and efficient method of filling customer orders and avoiding "stock outs".
 - (ii) To minimize the amount of money invested in inventory and money required to cover inventory "carrying cost".
 - (iii) To provide management with information needed to help achieve the two preceding objectives.

Question 2

- (a) What are the basic information requirements of production planning and control systems?
- (b) Explain the advantages and also the disadvantages of parallel conversion from manual to computerized system.
- (c) Explain the characteristics of client/server technology.
- (d) What is meant by Information security? (5+5+8+2= 20 Marks)

Answer

- (a) The basic information requirements of Production Planning and Control Systems are:
- (i) Firm's policy with regard to production of various products.
 - (ii) Sales order, sales forecast, stock position and order backlog.
 - (iii) Available labour force with their capabilities.
 - (iv) Standards of labour time, material, machine time and over-head costs etc.
 - (v) Schedule of meeting the sales orders, region wise, territory wise etc.
 - (vi) Quality norms for materials to be used for the finished products.
 - (vii) Break-up of the jobs and their resource requirements.
- (b) The advantages of parallel conversion from manual to computerized system are:
- (i) There is a possibility of checking new data against old data in order to catch any errors in processing the new system.
 - (ii) It offers a feeling of security to users, who are not forced to make an abrupt change to the new system.

The disadvantages of parallel conversion from manual to computerized system are:

- (i) The cost of running two systems at the same time.
- (ii) The burden on employees of virtually doubling their workload during conversion.
- (iii) Unless the system being replaced is a manual one, it is difficult to make comparisons between output of the new system and the old one.

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- (iv) It is understandable that employees who are faced with a choice between two systems will continue using the old one because of their familiarity with it.
- (c) The characteristics of client/server technology are:
 - (i) Client/server architecture consists of a client process and a server process that can be distinguished from each other.
 - (ii) The client portion and the server portion can operate on separate computer platforms.
 - (iii) Either the client platform or the server platform can be upgraded without having to upgrade the other platform.
 - (iv) The server is able to service multiple clients concurrently, in some systems, clients can access multiple servers.
 - (v) The client/server system includes some sort of networking capability.
 - (vi) A significant portion of the application logic resides at the client end.
 - (vii) Action is usually initiated at the client end, not the server end.
 - (vii) A user friendly graphical user interface generally resides at the client end.
 - (viii) A structured query language (SQL) capability is characteristic of the majority of client/server systems.
 - (ix) The database server should provide data protection and security.
- (d) Information security relates to the protection of the data or information recorded, processed, stored, saved, transmitted or retrieved from an electronic medium against loss, disclosure, damage, inaccessibility or alteration. The data or information is protected against harm from threats that will lead to its loss, inaccessibility, alteration, or wrongful disclosure. The protection is achieved through a layered series of technological and non-technological safeguards, such as physical security measures, user identifiers, passwords, smart cards, biometrics, firewalls, etc.

Question 3

- (a) Describe the five characteristics of the types of information used in executive decision making.
- (b) What are the risks involved in the end-user computing?
- (c) Give an example for the source document fraud. How will you control against this type of exposure?
- (d) What are the important factors which should be considered by the system analyst while designing user output?
(5X4= 20 Marks)

Answer

- (a) The five characteristics of the types of information used in executive decision making are:

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- (i) Lack of structure: Most of the decisions made by executives are relatively unstructured. For instance, what general direction should the company take? Or what type of advertising campaign will best promote the new product line? These types of decisions are not as clear-cut as deciding how to debug a computer program or how to deal with an overdue account balance. Also it is not always obvious which data are required or how to weigh available data to reach a decision.
 - (ii) High degree of uncertainty: Executives work in a decision space that is often characterized by a lack of precedents and where results are not scientifically predictable from actions.
 - (iii) Future orientation: Strategic planning decisions are made in order to shape future events. As conditions change, organisations must change also. It is the executive's responsibility to make sure that the organization keeps pointed toward the future.
 - (iv) Informal sources: Executives rely heavily on informal sources for key information like the media, business meetings, tours etc. some other important information sources of information are meetings, tours around the company's facilities to chat with employees, brainstorming with a trusted colleague or two, and social events.
 - (v) Low level of detail: Most important executive decisions are made by observing broad trends. This requires the executives to be more aware of the large overview than the tiny items.
- (b) The risks involved in the end-user computing are:
- (i) A decline in standards and controls. When an analyst is in-charge of developments, walk-through will be done and standards and policies will be enforced; these things are unlikely to be carried out to the same degree with end-user computing.
 - (ii) Inaccuracy of specification requirements. The end user will not have the experience of an analyst in completing an accurate specification and system requirements.
 - (iii) Due to the lack of adequate specifications, there would be a reduction in the quality assurance and stability of the system.
 - (iv) An increase in unrelated and incompatible systems. Departments would choose their own software and hardware and incompatibility of systems would result.
 - (v) Difficulties in accessing could arise for users trying to access a central system, such as the corporate database, with a proliferation of different systems and applications.
- (c) In systems that use physical source documents to initiate transactions, careful control must be exercised over these instruments. Source document fraud can be used to remove assets from the organisation. The example of source document fraud can be an individual with access to purchase orders and receiving reports could fabricate a purchase transaction to a non-existent supplier. If these documents were entered into the data processing stream, along with a fabricated vendor's invoice, the system could process these documents as if a legitimate transaction had taken place. In the absence of other compensating controls to detect this type of fraud, the system would create an account payable and subsequently write a cheque for payment.

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To control against these types of source document frauds, the following measures can be taken:

- (i) Use pre-numbered source documents, coming from the printer with a unique sequential number on each document. Source document numbers permit accurate accounting of document usage and provide an audit trail for tracing transactions through accounting records.
 - (ii) Use source documents in sequence. Source documents should be distributed to the users and used in sequence. This requires that adequate physical security be maintained over the source document inventory at the user site. When not in use, documents should be locked away. At all times, access to source documents should be limited to authorised persons.
 - (iii) Periodically audit the source documents and compare the number of documents used with those remaining in inventory plus those voided due to errors. Documents not accounted for should be reported to management.
- (d) The important factors which should be considered by the system analyst while designing user output are:
- (i) **Content:** It refers to the actual pieces of data included among the outputs provided to users. For example, the contents of a weekly report to a sales manager might consist of sales person's name, sales calls made by each sales person during the week, and the amount of each product sold by each salesperson to each major client category. Systems designers generally put too much content into managerial reports instead of two little which leads to waste of time to isolate the required information. Hence, only the required information should be included in various outputs.
 - (ii) **Form:** It refers to the way that content is presented to users. It can be quantitative non-quantitative, text, graphics, video and audio. The form of output should be decided keeping in view the requirements of the users.
 - (iii) **Out put volume:** It is the amount of data output required at any one time. It is better to use high-speed printer or a rapid-retrieval display unit, which are fast and frequently used output devices in case the volume is heavy. Unusually heavy output volume normally causes concern about paper cost. In such a case, alternative methods of output display such as COM (Computer Output Microfiche) may be considered. The choice of output medium/device should be decided based on the volume of output.
 - (iv) **Timeliness:** It refers to when users need output. Some outputs are required on a regular periodic basis perhaps daily, weekly, monthly, at the end of a quarter or annually. Others are generated on request. A sales manager, for example, may be requiring a weekly sales report. Other users, such as airline agents, require both real- time information and rapid response times in order to render better client service. Hence, the system designer might require that display information be provided to the airline agents within a few seconds at least 95% of the time.

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- (v) Media: It refers to the physical device used for input, storage or output. The system designer should select a medium which is best suited to the user requirements. A variety of output media are available in the market these days which include paper, video display, microfilm, magnetic tape/disk and voice output. Many of these media are available in different forms. The system designer can select a medium, which is best suited to the user requirements.
- (vi) Format: It refers to the manner in which data are physically arranged. Output format is data output on a printed report or on a display screen. The format of the output should be properly designed; it should be intelligent and decision impelling.

Question 4

- (a) Briefly discuss some of the design tools that are available now-a-days.
- (b) What are the key characteristics of a true ERP-enterprise resource planning solution?
- (c) What are the different levels of integration of 'Case' tools?
- (d) Give some techniques used to preserve audit trails in a computer based information systems environment. (5X4= 20 Marks)

Answer

- (a) Some of the design tools that are used for programming are:
 - (i) Program flow chart: Program flow chart is among the most common program design tools that managers and users encounter when reviewing the design work of the system development project. It depicts the logical steps through which a computer program must proceed when solving a problem. It is a widely used program design tool.
 - (ii) Pseudo code: When reviewing the work done by a program designer, users may also need to review narrative descriptions of program logic. Pseudo code, like program flow charts, pseudo-code represents program logic; however it presents program logic in English like statements. It is generally preferred by programmers since it represents program code more closely.
 - (iii) Structure Chart: It looks similar to corporate organization chart, which are useful for organizing problems. It organizes each of the program tasks into well defined modules. The higher-level modules represent control portions of the program; the lowest level modules do the actual task of the program. Unlike either flow charts or pseudo code, the structure chart does not give any detail of the actual program logic and the order in which various tasks are executed. Instead they show how all the logical functions of the program fit together as a whole.
 - (iv) 4 GL Tools: Fourth generation language tools automate many of the manual tasks by using 4GL tools. These tools ensure that the work done with them is consistent with the other work performed by the system team. The automation of manual task and internal consistency checks are two reasons due to which productivity gains result from using 4GL tools.

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- (v) Object oriented programs and design tools: These tools provide a means of enhancing programmer productivity and of reducing the application backlogs common in many organisations. With the help of this design tool, the programmer prepares a model that describes object, classes and their relationships to one another. This design is often taken from a data flow diagram (DFD).
- (b) The key characteristics of an enterprise resource planning solution are:
 - (i) Flexibility: An ERP system should be flexible to respond to the changing needs of an enterprise. The client server technology enables ERP to run across various database back ends through Open Database Connectivity (ODBC).
 - (ii) Modular and open: ERP system should have open system architecture. This means that any module can be interfaced or detached whenever required without affecting the other modules. It should support multiple hardware platforms for the companies having heterogeneous collection of systems. It must support some third party add-ons also.
 - (iii) Comprehensive: It should be able to support variety of organizational functions and must be suitable for a wide range of business organizations.
 - (iv) Beyond the company: It should not be confined to the organizational boundaries, rather support on-line connectivity to the other business entities of the organisation.
 - (v) Best business practices: It must have a collection of the best business processes applicable world-wide. An ERP package imposes its own logic on a company's strategy, culture and organisation.
- (c) The different levels of integration of 'CASE' tools are:
 - (i) Platform integration: Platform integration means that the tools or work benches to be implemented run on the same platform where platform means a single computer/ operating system or a network of systems. Tools run on the same hardware/ operating system platform.
 - (ii) Data integration: Tools operate using a shared data model. The result from one tool can be passed on as input to another tool.

There are a number of different levels of data integration:

- Shared files: All tools recognize a single file format. The most general purpose shareable file format is where files are made of lines of characters.
- Shared data structures: The tools make use of shared data structures which usually include program or design language information.
- Shared repository: The tools are integrated around an object management system which includes a public share data model describing the data entities and relationships which can be manipulated by the tools.

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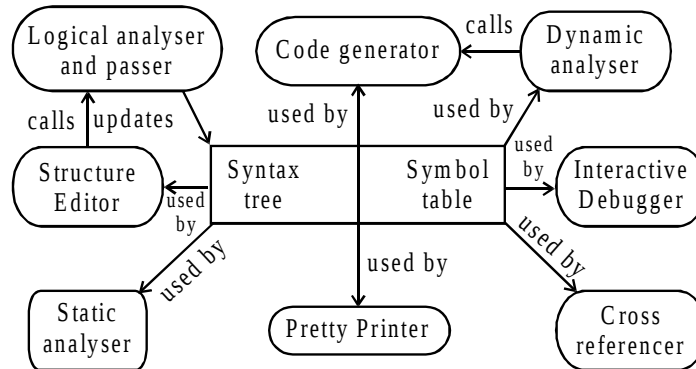


Figure: Integration through shared Data Structure

- (iii) Presentation integration: Tools offer a common user interface, style and a set of common standards for user interaction.

There are three different levels of presentation integration.

- Window system integration: Tools which are integrated at this level use the same underlying window system and present a common interface for window manipulation commands.
- Tools which are integrated at this level use the same form of commands for comparable functions.
- Interaction Integration: This is related with a direct manipulation interface where the user interacts with a graphical or textual view of the entity.

- (iv) Control integration: Tools may activate and control the operation of other tools. One tool is able to start and stop other tools. The tool can also call the sources of another tool in the system.

- (v) Process integration: It is guided by a process model. Activities and deliverables are identified, a coordination strategy defined and tools required to support activities are specified.

- (d) The techniques used to preserve audit trails in a computer based information systems environment are:

- (i) Transaction logs: Every transaction successfully processed by the system should be recorded on a transaction log which serves as a journal. It is a permanent record of transactions.

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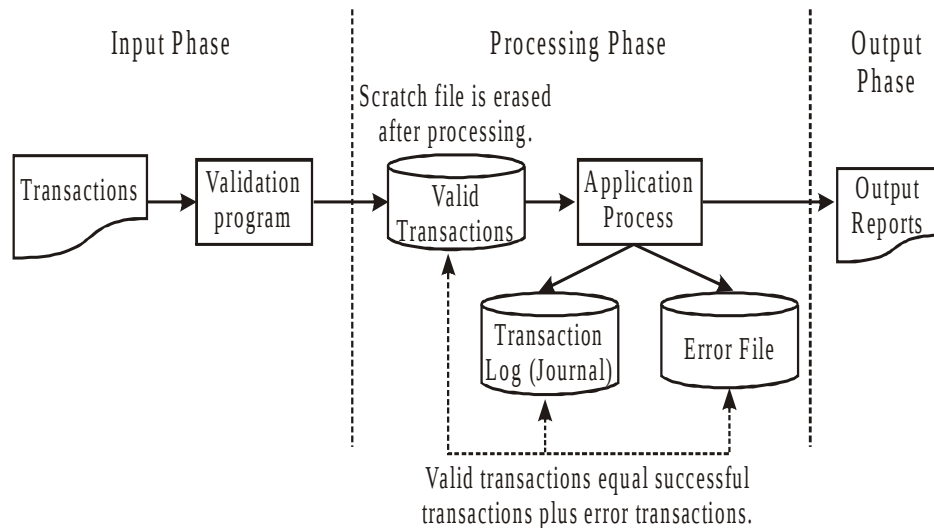


Figure: Transaction Log to Preserve the Audit Trail

There are two reasons for creating a transaction log. First, the transaction log is a permanent record of transactions. The validated transaction file produced at the data input phase is usually a temporary file. Once processed, the records on this file are erased (scratched) to make room for the next batch of transactions. Second, not all of the records in the validated transaction file may be successfully processed. Some of these records may fail tests in the subsequent processing stages. A transaction log should contain only successful transactions – those that have changed account balances. Unsuccessful transactions should be placed in an error file. The transaction log and error files combined should account for all the transactions in the batch. The validated transaction file may then be scratched with no loss of data.

- (ii) Transaction listings: The system should produce a (hard copy) transaction listing of all successful transactions. These lists should be used by users for reconciliation with input.
- (iii) Log of Automatic Transactions: Some transactions are triggered internally by the system. An example of this is when inventory drops below a preset reorder point, and the system automatically processes a purchase order. To maintain an audit trail of these activities all internally generated transactions must be placed in a transaction log.
- (iv) Listing of automatic transactions: To maintain control over automatic transactions processed by the system, the responsible end user should receive a detailed listing of all internally generated transactions.
- (v) Unique transaction identifiers: Each transaction processed by the system must be uniquely identified with a transaction number. This number may be pre-printed on the documents in batch processing or system generated in real-time systems.

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- (vi) Error listing: A listing of all error records should go to the appropriate user to support error correction and resubmission.

Question 5

- (a) What are the objectives of audit trail?
 - (b) Explain the characteristics of the Internet which are likely to attract fraudsters.
 - (c) The audit methods that are effective for manual audits prove ineffective in many 'IS' audits. Can you explain the reasons?
 - (d) Define the following terms:
 - (i) Computer resources
 - (ii) Digital Signatures
 - (iii) Private key
 - (iv) Public key
 - (v) Key pair.
- (5X4= 20 Marks)

Answer

- (a) The objectives of an audit trail are:
 - (i) Detecting unauthorized access to the system: A real time audit trail is used to protect the system from outsiders who are trying to breach system controls and to report on changes in system performance that may indicate infestation by a virus or worm. Depending upon how much activity is being logged and reviewed; real-time detection can impose a significant overhead on the operating system, which can degrade operational performance. After-the-fact detection logs can be stored electronically and reviewed periodically or as needed. When properly designed, they can be used to determine if unauthorized access was accomplished, or attempted and failed.
 - (ii) Reconstructing events: Audit analysis can be used to reconstruct the steps that led to events such as system failures, security violations by individuals or application processing errors. Knowledge of the conditions that existed at the time of a system failure can be used to assign responsibility and to avoid similar situations in the future. It can also play important role in accounting control. For example, by maintaining a record of all changes to account balances, the audit trail can be used to reconstruct accounting data files that were corrupted by a system failure.
 - (iii) Personal Accountability: Audit trail can be used to monitor user activity at the lowest level of detail. This capability is a preventive control that can be used to influence behavior.

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- (b) The characteristics of the Internet which are likely to attract fraudsters are:
 - (i) It is unregulated in so far as who may set up a site. No license fees are payable to any central authority and no form of vetting could be carried out on those persons or entities setting up sites.
 - (ii) An Internet site can be set up anywhere in the world at very low cost and can reach anywhere else at low cost. This means that fraudsters now have “global reach” and can access a far larger market of potential victims than ever before. As fraudsters are always looking for new victims, this is a very attractive feature.
 - (iii) An impressive site with links to established companies may be no more than an empty shell designed to attract and trap the unwary.
 - (iv) The glamour and novelty of the Internet and the spurious credibility claimed by a site may cause otherwise prudent investors to become involved in fraudulent schemes.
 - (v) A site may operate outside the legal jurisdiction of the country in which the victim of the fraud resides. A company which gives itself a UK Internet address need have absolutely no legal or commercial connection with the jurisdiction.
- (c) The audit methods that are effective for manual audits prove ineffective in many Information System audits because of these factors:
 - (i) Electronic evidence: Essential evidence is not physically retrievable by most auditors, and it is not readable in its original electronic form.
 - (ii) Terminology: The tools and techniques used in automated applications are described in terms that are difficult for the non-EDP auditors to understand.
 - (iii) Automated processes: The methods of processing are automated rather than manual, making it difficult for the non-EDP auditors to comprehend processing concepts and the logic of these concepts.
 - (iv) New risks and controls: Threats to computer systems and the countermeasures to those threats are new to non-EDP auditors and the magnitude of the risks and the effectiveness of the controls are not understood.
 - (v) Reliance on Controls: In manual systems, the auditor can place some reliance on hard-copy evidence, regardless of the adequacy of the controls. But in automated systems, the electronic evidence is only as valid as the adequacy of controls.
- (d)
 - (i) Computer Resource: “Computer resource” means computer, computer system, computer network, data, computer data base or software.
 - (ii) Digital signature: “digital signature” means authentication of any electronic record by a subscriber by means of an electronic method or procedure in accordance with the provisions of section 3 of IT Act, 2000.
 - (iii) Private key: “private key” means the key of a key pair used to create a digital signature.

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- (iv) Public key: "public key" means the key of a key pair used to verify a digital signature and listed in the Digital Signature Certificate.
- (v) Key pair: "key pair", in an asymmetric crypto system, means a private key and its mathematically related public key, which are so related that the public key can verify a digital signature created by the private key.