SOS POLITICAL SCIENCE AND PUBLIC ADMINISTRATION
MBA HRD 205
SUBJECT NAME: MANAGEMENT INFORMATION SYSTEM

UNIT-V

TOPIC NAME: SYSTEM RELATED CONCEPTS

A. BOUNDARY- INTERFACE AND BLACK BOX SYSTEM DECOMPOSITION:

In the physical sciences, an interface is the boundary between two spatial regions occupied by different matter, or by matter in different physical states. The interface between matter and air, or matter and vacuum, is called a surface, and studied in surface science.

The importance of the interface depends on the type of system: the bigger the quotient area/volume, the greater the effect the interface will have. Consequently, interfaces are very important in systems with large interface area-to-volume ratios, such as colloids.

Interfaces can be flat or curved. For example, oil droplets in a salad dressing are spherical but the interface between water and air in a glass of water is mostly flat.

Surface tension is the physical property which rules interface processes involving liquids. For a liquid film on flat surfaces, the liquid-vapor interface keeps flat to minimize interfacial area and system free energy. For a liquid film on rough surfaces, the surface tension tends to keep the meniscus flat, while the disjoining pressure makes the film conformal to the substrate. The equilibrium meniscus shape is a result of the competition between the capillary pressure and disjoining pressure.

Interfaces may cause various optical phenomena, such as refraction. Optical lenses serve as an example of a practical application of the interface between glass and air.

One topical interface system is the gas-liquid interface between aerosols and other atmospheric molecules.

The transformation process in certain sub-system, especially at the lowest level may not be defined. However, the inputs and outputs are known. Such a sub-system, whose processes are not defined, is called a black box system.

BLACK BOX TESTING is defined as a testing technique in which functionality of the Application Under Test (AUT) is tested without looking at the internal code structure, implementation details and knowledge of internal paths of the software. This type of testing is based entirely on software requirements and specifications. In Black Box Testing we just focus on inputs and output of the software system without bothering about internal knowledge of the software program.

The above Black-Box can be any software system you want to test. For Example, an operating system like Windows, a website like Google, a database like Oracle or even your own custom application.

Under Black Box Testing, you can test these applications by just focusing on the inputs and outputs without knowing their internal code implementation.

HOW TO DO BLACK BOX TESTING:

Here are the generic steps followed to carry out any type of Black Box Testing.

- Initially, the requirements and specifications of the system are examined.
- Tester chooses valid inputs (positive test scenario) to check whether SUT processes them correctly. Also, some invalid inputs (negative test scenario) are chosen to verify that the SUT is able to detect them.
- Tester determines expected outputs for all those inputs.
- Software tester constructs test cases with the selected inputs.
- The test cases are executed.
- Software tester compares the actual outputs with the expected outputs.

- Defects if any are fixed and re-tested.

TYPES OF BLACK BOX TESTING:

There are many types of Black Box Testing but the following are the prominent ones -

- **Functional testing** - This black box testing type is related to the functional requirements of a system; it is done by software testers.
- **Non-functional testing** - This type of black box testing is not related to testing of specific functionality, but non-functional requirements such as performance, scalability, usability.
- **Regression testing** - Regression Testing is done after code fixes, upgrades or any other system maintenance to check the new code has not affected the existing code.

TOOLS USED FOR BLACK BOX TESTING:

Tools used for Black box testing largely depend on the type of black box testing you are doing.

- For Functional/ Regression Tests you can use - QTP, Selenium
- For Non-Functional Tests, you can use – Load Runner, J meter

BLACK BOX TESTING TECHNIQUES:

Following are the prominent Test Strategy amongst the many used in Black box Testing

- **Equivalence Class Testing:** It is used to minimize the number of possible test cases to an optimum level while maintains reasonable test coverage.
- **Boundary Value Testing:** Boundary value testing is focused on the values at boundaries. This technique determines whether a certain range of values are acceptable by the system or not. It is very useful in reducing the number of test cases. It is most suitable for the systems where an input is within certain ranges.
- **Decision Table Testing**: A decision table puts causes and their effects in a matrix. There is a unique combination in each column.

B. INTEGRATION OF SUB- SYSTEM:

System integration is defined in engineering as the process of bringing together the component sub-systems into one system (an aggregation of subsystems cooperating so that the system is able to deliver the overarching functionality) and ensuring that the subsystems function together as a system, and in information technology as the process of linking together different computing systems and software applications physically or functionally, to act as a coordinated whole.

The system integrator integrates discrete systems utilizing a variety of techniques such as computer networking, enterprise application integration, business process management or manual programming.

System integration involves integrating existing, often disparate systems in such a way "that focuses on increasing value to the customer" (e.g., improved product quality and performance) while at the same time providing value to the company (e.g., reducing operational costs and improving response time). In the modern world connected by Internet, the role of system integration engineers is important: more and more systems are designed to connect, both within the system under construction and to systems that are already deployed.

Sub-System Integration

Integrate with any third-party system

Open architecture solutions that seamlessly integrate third-party sub-systems, pairing vital security, process, and safety data with surveillance footage for complete situational awareness and security control.

Access and intrusion detection:

Supporting all leading open integration standards and protocols, including ONVIF, OPC, MODBUS, and SNMP, and with custom interface capability, our end-to-end solutions give customers the flexibility to integrate, monitor, and manage data from a wide range of third-party sub-systems that are vital to effective security management.

Access control, surveillance, and intrusion detection integration is a particularly common application. Unifying data from these three key systems ensures operators located on site, or remotely, are immediately alerted to suspicious activity – including unauthorized card usage, closure failure/door malfunctions, unscheduled maintenance, movement in unauthorized zones etc. – and are able to visually verify threats from live video feeds prioritized on screen according to best field of view.

In addition to improving threat detection, this solution also reduces costly false alarms, drives cost and efficiency gains, and supports staff safety by presenting a clear view of who is on site at any one location.

Analytics:

For enhanced security management, our solutions – driven by Synergy 3 – also help organizations make sense of data by integrating with leading video content analysis (VCA) software and hardware, including analytics-enabled cameras (Synectics or third-party).

Our powerful command and control solution supports integration with VCA applications including virtual tripwires/motion detection, left-object detection, loitering detection, heat maps, flame/smoke/chemical detection, footfall, headcount, and facial recognition. And, because Synergy 3 is conformant with ONVIF Profile C, it also supports data analytics through direct integration with sensor-based edge devices. All data captured can be custom-alarmed as part of the overarching security management solution.

Biometrics:

Synectics' security management solutions also support the adoption of biometric control systems, such as fingerprint, voice, iris, and facial recognition, for improved authentication, verification, and identification.

Ideal for highly secure zones with multiple clearance levels, our solutions ensure biometric access data can be instantly cross-referenced with and verified against staff and/or supplier databases, shift schedules, and – particularly in the case of facial recognition – watch list information.

Building management systems:

Reflecting the merging worlds of security and facilities management, integration with building management systems (BMS) – or building automation systems (BAS) as they are sometimes known – has become another common application for Synectics' sub-system integration capabilities.

The benefits of integrating BMS include localized and/or remote video verification of activations, remote setting and resetting of alarm systems for improved efficiency, rapid identification of unauthorized building access, and immediate verification of fire/smoke detection alerts to ensure rapid evacuation or to avoid unnecessary false alarm costs. Increasingly, BMS integration also supports improved environmental efficiencies i.e. enabling lights, heating, and ventilation to be monitored and controlled centrally.

Process control systems:

For industrial environments, data generated by process control systems provides a vital indicator of operational consistency and safety. Anomalous activity/sensor readings can also be indicative of a potential security issue, e.g. malicious damage/attack.

Our solutions ensure data from process control sub-systems and associated edge devices can be integrated, monitored, and analyzed to identify single or combination events that may signify an issue, alerting operators according to the threat potential. Coupled with features such as integrated GIS mapping, and, of course, live surveillance feed integration, operators can pinpoint problem locations, visually verify threats if possible/appropriate, and deploy maintenance or security teams as required.

Lone-worker protection:

Data from GPS trackers or body-worn sensors can also be integrated, monitored, analyzed, and programmed to alert control room operators to any anomalous results.

If a lone worker collapses or fails to check in at a scheduled location, the system flags the individual's location and prioritizes the closest camera or communications link, enabling operators to assess status and guide emergency responders if required.

C. HUMAN AS AN INFORMATION PROCESSING STSTEM:

The problem solving process can be considered a human information processing system. Haber (1969) has pointed out some basic assumptions of the information-processing approach in psychology. His assumptions are called (1) the stage assumption and (2) the limited capacity assumption. It is assumed in the stage assumption that the processing of information can be broken down into sub processes or stages. That is, the time interval between the stimulus and the response can be divided up into smaller intervals, and each of these corresponds to some subset of events that intervenes between stimulus and response. In the course of the stages the original information undergoes successive transformations. For example, a visual event is changed first to a recognized category (say, a red traffic light) and next to a condition for applying a rule (for example, I had better stop this vehicle). In essence, isolating a stage of information processing is not done arbitrarily: rather, a stage of processing generally corresponds to some representation of the stimulus information. As the information goes from one stage to another, its representation changes accordingly.

At each stage of processing in the limited capacity assumption, we can identify limits on the human capacity to process information. For example, if we are driving and see a red light, a traffic cop, several pretty. Pedestrians, and a fire truck, then we might have too many stimuli to register in the visual system at the same time. This result in a sensory overload on capacity and overloads can lead to several complications. First, some information may not enter the system. Second, we might recode the stimulus situation; that is we might transform it to a new stimulus. Another option might be to process the information more selectively; we might just look at the pedestrians, and ignore the light, cop, and fire truck.

Newell and Simon (1972) further define several different components that make up the human information processing system (IPS):

1. There exists a set of elements called symbols.
2. A symbol structure consists of a set of tokens (equivalently, instances or occurrences) of symbols connected by a set of relations.
3. Memory is a component of the information processing system, capable of storing and retaining symbolic structures.
4. An information process is a process that has symbol structures for some of its inputs and outputs.
5. A processor is a component of an IPS consisting of:

a fixed set of elementary information processes (eip's)
b. a short-term memory (STM) that holds the input and output symbol structures of the eip's;
c. an interpreter that determines the sequence of eip's to be executed by the IPS as a function of the symbol structure in STM.

6. A symbol structure designates an object if there exist information processes that recognize the symbol structure as input and either:

Affect the object directly; or
b. produce as output, symbol structures that depend on the object.

7. A symbol structure is a program if:

The object it designates is an information process and
b. the interpreter, if given the program, can execute the designated process.

8. A symbol is primitive if its designation is fixed by the elementary information processes or by the external environment of the IPS.

With the components of the IPS defined, we can now study the actual system. A commonly accepted and simplified model is presented below.

In the first stage of information processing, a certain amount of information about the stimulus is registered or entered in the system. The holding place for information is referred to as the sensory register because information enters the system by one or more of the five senses and is held briefly in sensory form. The information can stay in a register for a brief time, but the longer it stays there the weaker it gets (decays).

While information is in a sensory register, the processor comes into play. One of the characteristics of the processor is pattern recognition, a complex process involving contact between the information in a sensory register and previously acquired knowledge. That is, a pattern is said to be recognized when the sensory aspects of the pattern are in some way equated with meaningful concepts. Thus, pattern recognition can be thought of as assigning meaning to a stimulus. It serves the function of briefly holding information about a stimulus in the system in what is called "veridical" form—that is, in much the same form as was initially presented--until it can be put into a new form and sent further into the system.

Closely related to pattern recognition is the process of attention. One definition of attention is "paying attention to" in the sense of tuning in, not tuning out. Selective attention makes it possible to focus on, or tune in, the relevant information and to filter out the rest. Thus attention ensures that the more important information is brought into the limited-capacity system.

The smallest units of information held in the memories of the information processing system are symbols. There is no evidence that human long term memory (LTM) is fill able, and, hence, an infinite vocabulary of symbols may exist.

Human memory is described as being associative. Associatively is achieved by storing information in LTM in symbol structures, each consisting of a set of symbols connected by relations. Through learning, certain stimuli or patterns of stimuli from the input channels come to be designated by particular symbols and become recognizable. These recognizable stimulus patterns are called chunks. These stored symbols then serve as the internal representation for the corresponding stimulus patterns or chunks, and the chunks, on recognition, evoke their stored designators. These chunks are not innate, but are learned.

The IPS has a short-term memory of very small capacity. It appears that the contents of STM at any given moment consist of a small set of symbols, each of which can designate an entire structure of arbitrary size and complexity in LTM. The STM seems to be immediately and completely available to the IPS processes. The STM can be defined functionally as comprising the set of symbols that are available to an IPS process at a given instant of time (Newell and Simon, 1972).

According to Newell and Simon (1972), the amount of processing that can be accomplished in the IPS per unit of time depends on three parameters: (1) the number of processes it can do simultaneously, (2) the time it takes to do each process, and (3) the amount of work done by each individual process.

The human IPS is basically a serial system, in that it can only execute one elementary process at a time. Assuming an IPS to be serial does not imply that it cannot be aware of many things at once in the environment, in the sense of detecting and recognizing when a single stimulus occurs. This would seem to imply that behavior is serial if the information produced by a first process is required as input to a second. Hence, a serial IPS is one that can execute a single elementary process at a time.

The second factor determining how much processing the IPS can do is the time it takes to execute each information process. For elementary processes, memory access time provides an ultimate lower bound on processing time, for a process either takes as its input symbols already in STM or gets the inputs from another memory (either LTM or external environment)

D. INFORMATION FILTERING:

Information filtering deals with the delivery of information that the user is likely to find interesting or useful. An information filtering system assists users by filtering the data source and deliver relevant information to the users. When the delivered information comes in the form of suggestions an information filtering system is called a recommender system. Because users have different interests the information filtering system must be personalized to accommodate the individual user's interests. This requires the gathering of feedback from the user in order to make a user profile of the preferences.

Two major approaches exist for information filtering: Content-based filtering and collaborative filtering. A content-based filtering system selects items based on the correlation between the content of the items and the user's preferences, while a collaborative filtering system chooses items based on the correlation between people with similar preferences.

The content-based approach has its roots in the research field of information retrieval which has been studied since the late fifties. In an information retrieval system a user enters a request for information and the system responds by identifying information sources that are relevant to the query. Many techniques that are incorporated in an information retrieval system can also be employed by a content-based filtering system such as the vector space model, latent semantic indexing and relevance feedback. Content-based filtering differs from information retrieval in the manner in which the interests of a user are represented. Instead of using a query an information filtering system tries to model the user's long term interests.

Tapestry, an experimental mail system developed at the Xerox Palo Alto Research Center, was one of the first information filtering systems to include collaborative filtering. In Tapestry a user manually constructs a filter query based on the document content and on annotations from other users. For example, a user can request articles containing the word "internet" that the user Joe has evaluated as "excellent".

Although information filtering is often divided into content-based and collaborative filtering the two approaches can also be used together. Hybrid systems that follow this approach are based on the idea that incorporating both content and social information could lead to a better filtering technique.

Alternative approaches for filtering information have been proposed as well. Demographic filtering systems for example use demographic information such as age, gender and education to identify the types of users that like a certain item. Economic filtering systems select items based on the costs and benefits of producing and viewing them. An example of economic filtering is systems that adaptively schedule banner advertisements on the internet. Ad systems exist that learn to display ads that will yield the highest possible click-through rate based on the past behavior of the user. By directing ads to a more targeted population it could help internet providers and advertising agents increase their ad revenues.

E. HUMAN DIFFERENCE IN INFORMATION PROCESSING:

Performance in human computer interaction may be considered to be dependent on the main and interactive effects of interface, task, and user characteristics. Logical analysis suggests that some mapping of user types and interface types may improve performance, while others could hinder performance. Some results along these lines have been demonstrated, but have had limited generalizability due to various methodological issues and practical factors (Egan, 1988).

This research was aimed at determining whether the main and interactive effects of individual differences in information processing would be of a magnitude, and nature, that would concern researchers and practitioners in interface design. In practical terms, it was aimed at determining whether these effects would be stable and significant when considering experienced users, and in the context of simple every-day file management tasks performed across popular types of interfaces.

An experiment was conducted in which 18 experienced computer users served as subjects. Each subject performed two replications of each of five simple file management tasks, on each of three types of commonly used interfaces. Task instructions were presented on-line and the time taken to memorize these instructions was defined as coding latency, and used as the response measure. Coding Latency was hypothesized to be a measure of the time needed to convert the task statement into an action plan in the context of actions and methods available within an interface. Independent variables in the experiment were subjects' scores on several standard cognitive tests, and survey responses regarding subjects' age, computer experience, education, other relevant personal information, and perceptions of interface preference. Experimental hypotheses focused on the existence of a subject by interface interaction that could be described by the independent variables collected.

All the hypotheses were confirmed by the results. Subject by Interface interaction effects were sizable, and of the order of the task main effect, which was the strongest effect found in the experiment. A portion of both these major effects could be explained by the independent variables in the design. The results also suggested that the effects of individual differences could be significant across most forms of human computer interaction.

F. IMPLICATIONS OF INFORMATION SYSTEM:

Information systems can reduce the number of levels in an organization by providing managers with information to supervise larger numbers of workers and by giving lower-level employees more decision-making authority. Implementing information systems has consequences for task arrangements, structures, and people.

Implication of the information system in business:

It is not just business decisions, but life decisions that are acted upon from information that are received from our day to day experiences. Now a days, MIS is often equated to Computers and Networks applied to business — this was not always the case. In my early years as an analyst/programmer, I was tasked to automate a complex manual library system that was implemented 15 years before I arrived for a state regulatory agency. After about three weeks of analysis, I discovered that this manual system, which was managed by only two people, was surprisingly efficient. It provided the right information at the right time to persons who needed it. I then recommended to my boss that my time could be better spent in looking at other manual processes that could be automated and come back to the Library system at a future date.

In short, if it’s not broke — don’t fix it. You don’t want to automate chaos!

Impacts of information systems: four perspectives:

The paper reviews the information systems (ISs) literature to show that much work on ISs has been based on the perspectives of determinism (viewing the impacts of ISs on individuals, organizations, and society as a function of the technology alone), mechanism (viewing organizations and ISs as machines), and systems (founded on the analogy of organization with organism). These perspectives are inadequate to understanding the impacts of ISs and, consequently, to determining their value to the business. Work in the area of ISs requires an integrationist perspective, taking the effects of information technology (IT) to be a product of neither the technical nor the organizational aspects alone, but of their interaction. The integrationist approach has important implications for the management and appraisal of IT.

Implications for information system: strategic management:

Strategic control requires a greater variety of data types. Operating control problem typically have a smaller variety of data.

The total volume of data required for strategic control is smaller. On the other hand, perhaps thousands of pieces of data of each type are required for some of operating problems.

Strategic control data are more aggregated. Operating data are used at the most detailed at transaction level.

Strategic control data are less accurate. Operating data generally need to be as accurate as possible.

The most important strategic control is more sporadic. Data for strategic problems are received sporadically as events takes place.

Strategic control data are less process able by computer. The strategic controls that arise in the environment rather than within the organization are generally not so easily available.

The key decision in information for strategic control is what data to save. The principle problem in operating control information system design is the technological problem of efficiently capturing and retrieving data.