

9) What is socio-technical system? Mention essential characteristics of socio-technical System.

⇒ A system is a purposful collection of interrelated components that work together to achieve some objective is called socio-technical system.

Essential characteristics of socio-technical system are as follows:

i) They have emergent properties that are properties of the system as a whole rather than associated with individual parts of the system. Emergent properties depend on both the system components and relationships between them.

As this is so complex, the emergent properties can only be evaluated once the system has been assembled.

ii) They are often nondeterministic. This means that, when presented with a specific input, they may not always produce the same output.

The system's behaviour depends on the human operators, and people do not always react in same way. Furthermore, use of the system may create new relationship between the system components and hence change its emergent behaviour.

3) The extent to which the system supports organisational objectives does not just depend on the system itself. It also depends on the stability of these objectives, the relationships and conflicts between organisational objectives and how people in the organisation interpret these objectives.

10) What are the emergent system properties? Mention the types and explain each properties in detail.

→ Emergent properties are properties that are characteristic of the system as a whole and not its component parts.

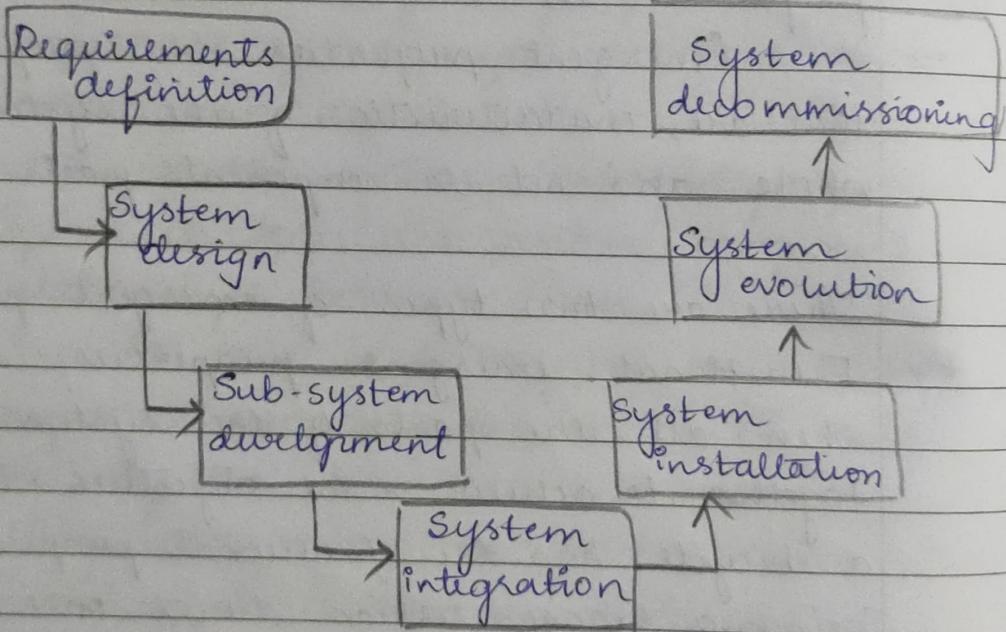
There are two types of emergent properties

* Functional emergent properties - appear when all the parts of the system work together to achieve some objective. For ex, a bicycle has the functional property of being a transportation device once it has been assembled from its components.

* Non-functional emergent properties - relate to the behaviour of the system in its operational environment. Examples of non-functional properties are reliability, performance, safety and security. These are often critical for computer-based system,

as failure to achieve some minimal defined level in these properties may make the system unusable. Some users may not need some system functions so the system may be acceptable without them. However a system that is unreliable or too slow is likely to be rejected by all its users.

- ii) With a neat diagram explain system engineering process.

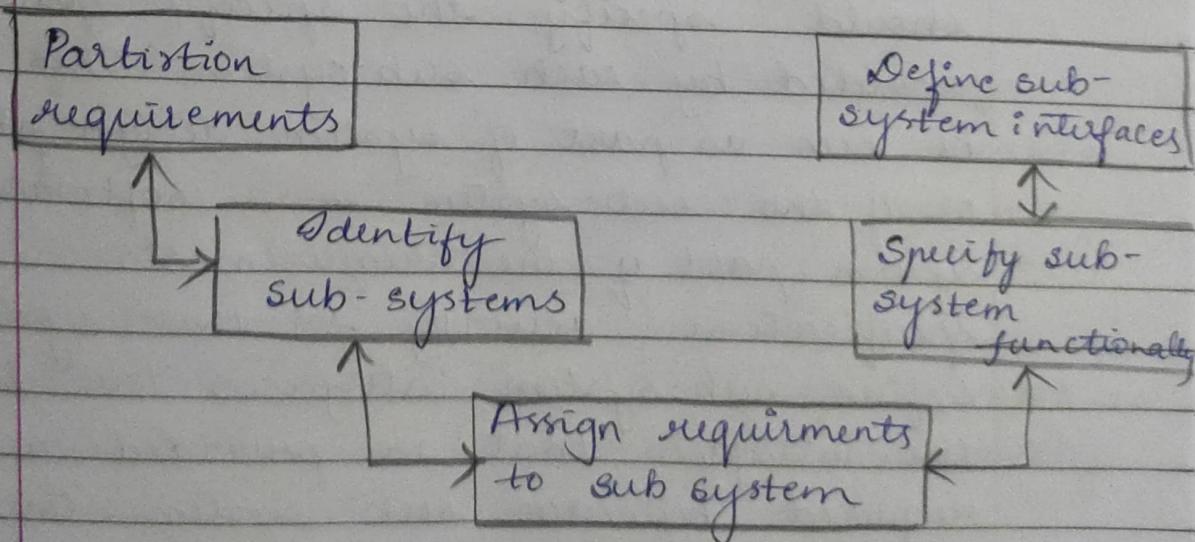


Systems engineering is the activity of specifying, designing, implementing, validating, deploying and maintaining socio-technical system.

There are important distinctions between the system engineering process and the software development process.

- * limited scope for rework during system development - Once some system engineering decisions, such as the siting of base stations in a mobile phone system, have been made, they are very expensive to change. Reworking the system design to solve these problems is rarely possible. One reason software has become so important in systems is that it allows changes to be made during system development, in response to new requirements.
- * Interdisciplinary involvement - Many engineering disciplines may be involved in system engineering. There is a lot of scope for misunderstanding because different engineers use different terminology and conventions.

Q) Explain with a neat diagram activities involved in a system design.



- * Partition requirements - You analyse the requirements and organise them into related groups. There are usually several possible partitioning options, and you may suggest a number of alternatives at this stage of the process.
- * Identify sub-systems - You should identify sub-systems that can individual or collectively meet the requirements. Groups of requirements are usually related to sub-system, so this activity and requirements partitioning may be amalgamated.
- * Assign requirements to sub-systems - You assign the requirements to sub-systems. In principle, this should be straightforward if the requirements partitioning is used to drive the sub-system identification.
- * Specify sub-system functionality - You should specify the specific functions provided by each sub-system. This may be seen as part of system design phase or if the sub-system is a software system, part of the requirements specification activity for that system.
- * Define sub-system interfaces - You define the interfaces that are provided and required by each sub-system. Once these interfaces have been agreed upon,

it becomes possible to develop these sub-systems in parallel.

- 13) Write a note on system decommissioning
- * System decommissioning means taking the system out of service after the end of its useful operational lifetime.
 - * For hardware systems this may involve disassembling and recycling materials or dealing with toxic substances.
 - * Software has no physical decommissioning problems, but some software may be incorporated in a system to assist with the decommissioning problems, but some software may be
 - * For example, software may be used to monitor the state of hardware components. When the system is decommissioned, components that are not worn can therefore be identified and reused in other systems.
 - * If the data in the system that is being decommissioned is still valuable to your organisation, you may have to convert it for use by some other system.
 - * This can often involve significant costs as the data structures may be implicitly defined in the software itself.

14) What are the factors that affect the system environment in system design?

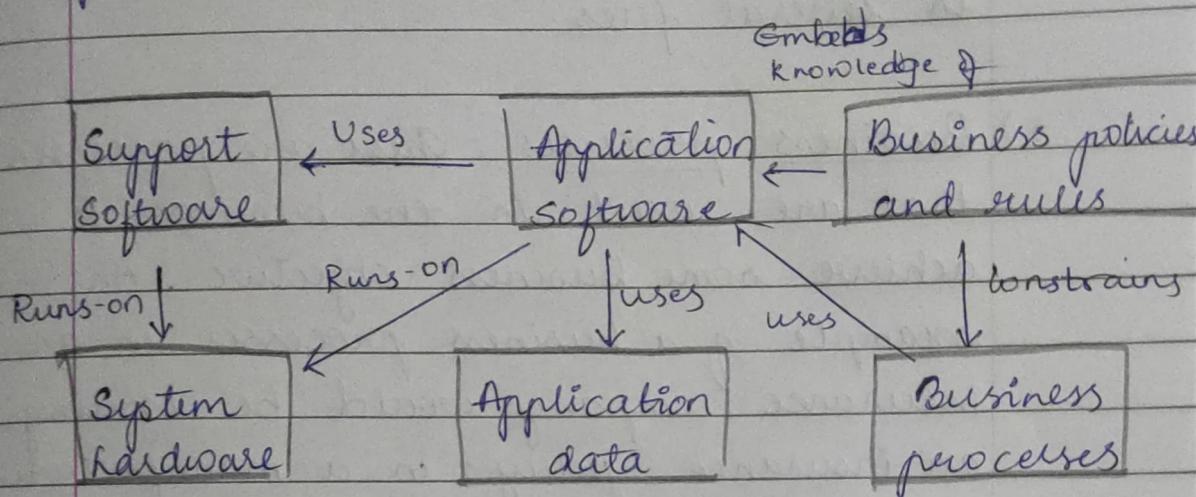
⇒ Human and organisational factors from the system's environment that affect the system design include:

- * Process changes - If changes are significant or if they involve people losing their jobs, there is a danger that the users will resist the introduction of the system.
- * Job changes - Designs that involve managers having to change their way of working to fit the computer system are often resisted. The managers may feel that their status in the organisation is being reduced by the system.
- * Organisational changes - If an organisation is dependent on a complex system, those who know how to operate the system have a great deal of political power.

15) Write a note on legacy system with neat diagram.

⇒ 1) System hardware - In many cases, legacy system have been written for main frame hardware that is no longer available, that is expensive to maintain and that may not be compatible with

current organisational IT purchasing policies.



- 2) Support Software - In many cases, legacy system have been written for mainframe hardware that is no longer available, that is expensive to maintain and that may not be compatible with current organisational IT purchasing policies.
- 3) Application software - The application system that provides the business services is usually composed of a number of separate programs that have been developed at different times. Sometimes the term legacy system means this application software system rather than the entire system.
- 4) Application data - These are the data that are processed by the application system. In many legacy systems, an immense volume of data has accumulated over the

lifetime of the system. This data may be inconsistent and may be duplicated in several files.

- 5) Business processes - These are processes that are used in the business to achieve some business objective. An example of a business processes in an insurance company would be issuing an insurance policy; in a manufacturing company, a business process would be accepting an order for products and setting up the associated manufacturing process.
- 6) Business policies and rules - These are definitions of how the business should be carried out and constraints on the business. Use of the legacy application system may be embedded in these policies and rules.