SPECIFIC ADAPTATION AND ITS MECHANISM

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ADAPTATION IN BIOLOGY

Adaptation, in biology, the process by which a species becomes fitted to its environment; it is the result of natural selection's acting upon heritable variation over several generations. Organisms are adapted to their environments in a great variety of ways: in their structure, physiology, and genetics, in their locomotion or dispersal, in their means of defense and attack, in their reproduction and development, and in other respects.

Adaptation is a trait with current functional role in the life of an organism that is maintened and evolved by means of natural selection.

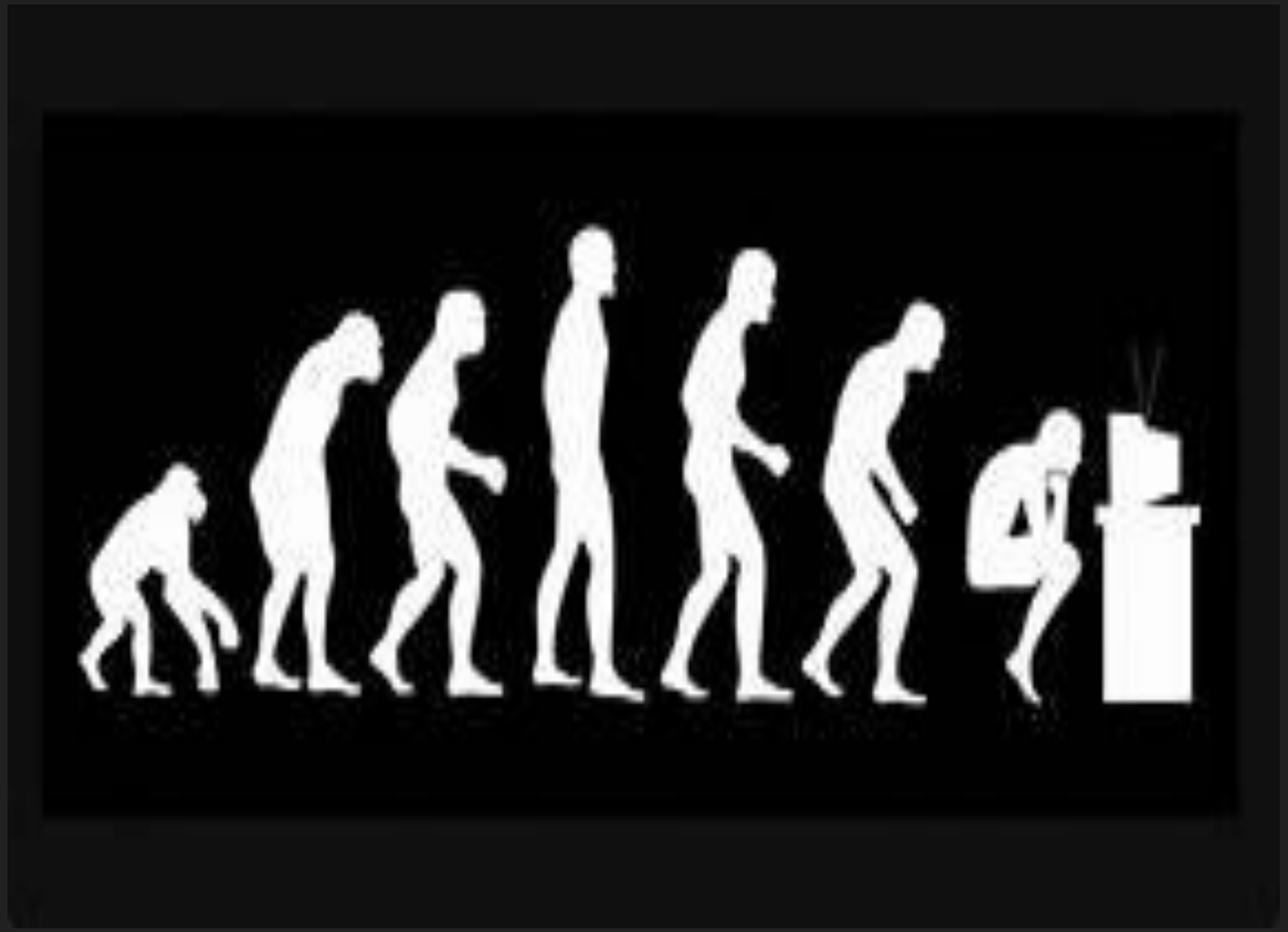
SPECIFIC ADAPTATION

Specific
Adaptation Recognizes a stressor Hormones are released Mobilizes energies to deal with the stressor Structures may be destroyed while dealing with the stressor (myosin heads during a muscular contraction) Magnitude and duration of the stressor.

SPECIFIC ADAPTATION TO IMPOSED DEMANDS [SAID]

The SAID principle is one of the most commonly referred to principles when creating training programs. SAID stands for **Specific Adaptations to Imposed Demands** and basically means that the changes, or adaptations, your body makes in response to training are specific to the stress, or stimulus, to which it is exposed.

In other words, the neural, structural and functional changes your body makes are directly related to the type of activity you partake in.



Specific

Adaptation to

Imposed

Demands

SPECIFIC ADAPTATION TO IMPOSED DEMAND PRINCIPLE

The SAID Principle

Adaptation is Specific. Let's take some simple examples. If you place mechanical stress on the bones of the body by...

The Right Amount of Stress. Stress in the right amount simply means not too much and not too little. If there isn't...

Carryover of Training to Sport. The carryover issue is a little more complex. Remember that that the S in SAID stands...

SAID - SPECIFIC ADAPTATION TO IMPOSED DEMAND

Specific Adaptation to Imposed Demands (SAID) Stages

Stress (stimulus) Exercise / Physical Activity

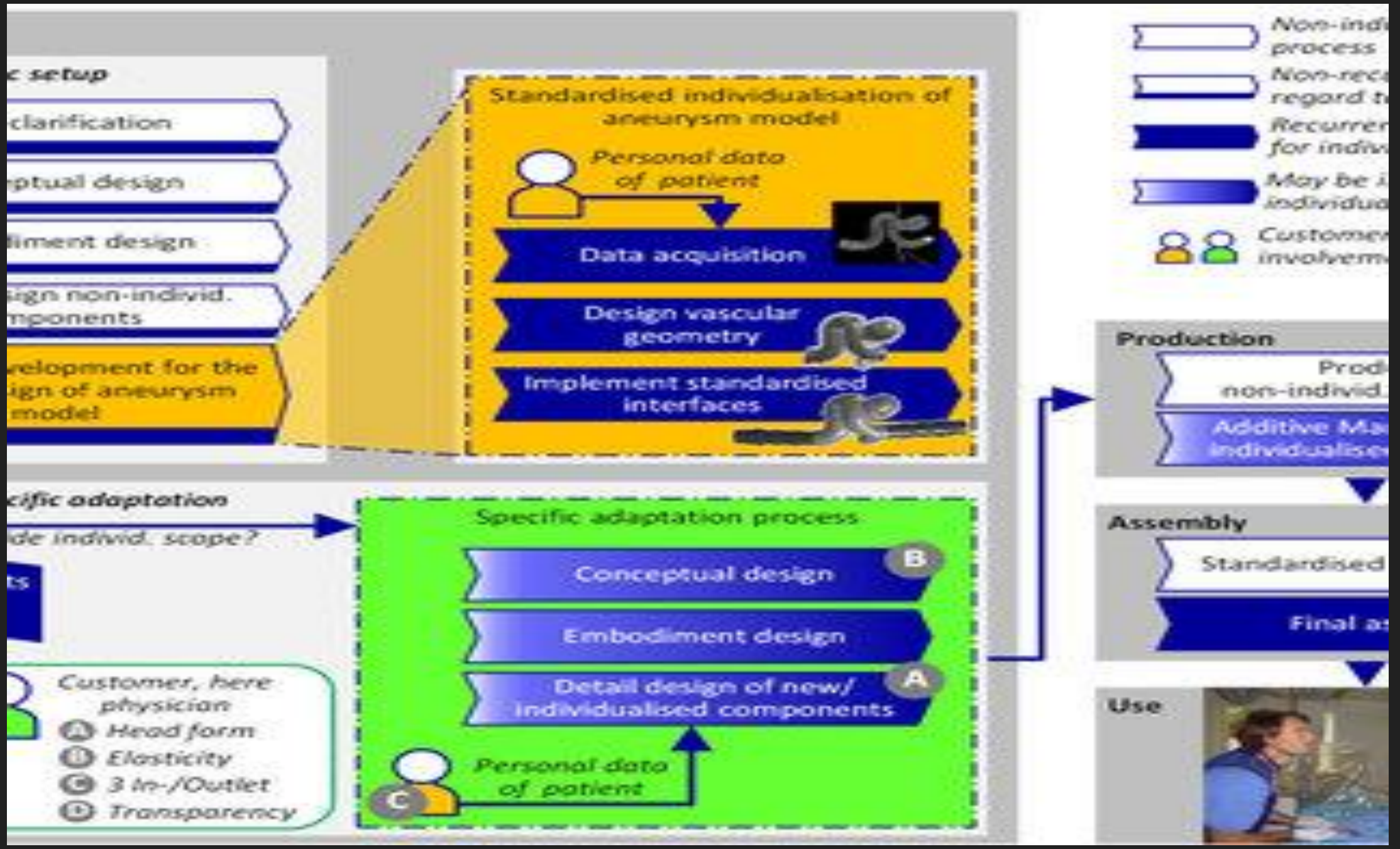
Exercise / Physical Activity

Adaptation (response) Specific responsive biological adjustment to stress Muscle, bone, heart, lung, vasculature,...

Specific responsive biological adjustment to stress Muscle, bone, heart, lung, vasculature, tendons, ligaments, joint...

Muscle, bone, heart, lung, vasculature, tendons, ligaments, joint cartilage, etc.

If stress is too great, or sufficient recovery time not allowed adaptation...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model
Standardised individualisation of aneurysm model
Personal data of patient
Data acquisition
Design vascular geometry
Implement standardised interfaces
cific adaptation
de individ. scope?
ts
Customer, here physician
A Head form
B Elasticity
C 3 In-/Outlet
D Transparency
Specific adaptation process
Conceptual design
B
Embodiment design
Detail design of new/ individualised components
A
Personal data of patient
C
Production
Prod
non-individ.
Additive Ma
individualise
Assembly
Standardised
Final as
Use

CHRONIC ADAPTATION

- Physiological Adaptions to Aerobic Endurance Training. There is no change in muscle strength. There is an increase in...
- Cardiovascular Adaptations. Aerobic endurance training requires people to have the proper progressions, variations,...
- Respiratory Adaptations. Ventilatory adaptations are highly specific to activities involving the type of exercise used...
- Neural Adaptations. There is increased efficiency and a delay in the fatigue of contractile mechanisms.

STAGES OF SAID

Stress (stimulus)

- Exercise / Physical Activity

Adaptation (response)

- Specific responsive biological adjustment to stress
  - Muscle, bone, heart, lung, vasculature, tendons, ligaments, joint cartilage, etc.
- If stress is too great, or sufficient recovery time not allowed
  - adaptation may be inhibited
  - decrement in capacity of physiological systems
    - See overtraining

Accommodation

- Adaptation response will begin to slow if the exact same stimulus is continued for a prolonged period of time.

Exhaustion

- Adaptation is complete after limited time span
- Continued stimulus no longer elicits adaptation

Other Examples (epidermis):

- Sun: sunburn or increase melanin
- Friction: blister / abrasion or callus

TRAINING SPECIFICITY

- Training effects are specific to the muscle groups used during training and the type of training program implemented (Fox 1975).
- Training specifically for the movement pattern, speed, joint position, speed, and type of contraction produces improvement, specifically in those movement parameters (Kreighbaum 1996).
  - Specific sport or activity yields greatest improvements
  - Supplement activity or sports training with resistance, cardiovascular, plyometrics, flexibility exercises
  - Utilize progression and periodization techniques
  - Also see Adaptation Criteria.

ADAPTATION IS SPECIFIC TO: MODE

Mode

- Type of training
  - Components of fitness
  - Metabolic Pathway
  - Also see Cross Training
- Mechanics
  - Motor Pattern
  - Mechanical forces on joints, and bones utilized
  - Muscles involved
  - Tension curve
  - Range of motion

ADAPTATION IS SPECIFIC: MODE

- Intensity
  - Effort
  - Resistance
  - Speed of contraction
    - power training examples
  - Metabolic pathways utilized
- Duration
  - Time exercising
  - Recovery between bouts or work intervals
  - Number of reps
  - Number of exercises and sets
- Frequency
  - Recovery

IDENTICAL ELEMENT THEORY

Identical-elements Theory

- Transfer of learning between various skills and exercise routines can occur if the main elements underlying different skills or situations surrounding performance are identical and similar in nature.
  - Eg: Gymnastic training aimed at practicing complex exercise maneuvers complement (positively transfer) to the springboard diving.
- As the degree of similarity between stimuli and responses decline, conflicting consequences may be experienced.
  - Transition from gymnastic to diving may not likely transfer because of the dissimilarity between diving and gymnastic somersaulting techniques.

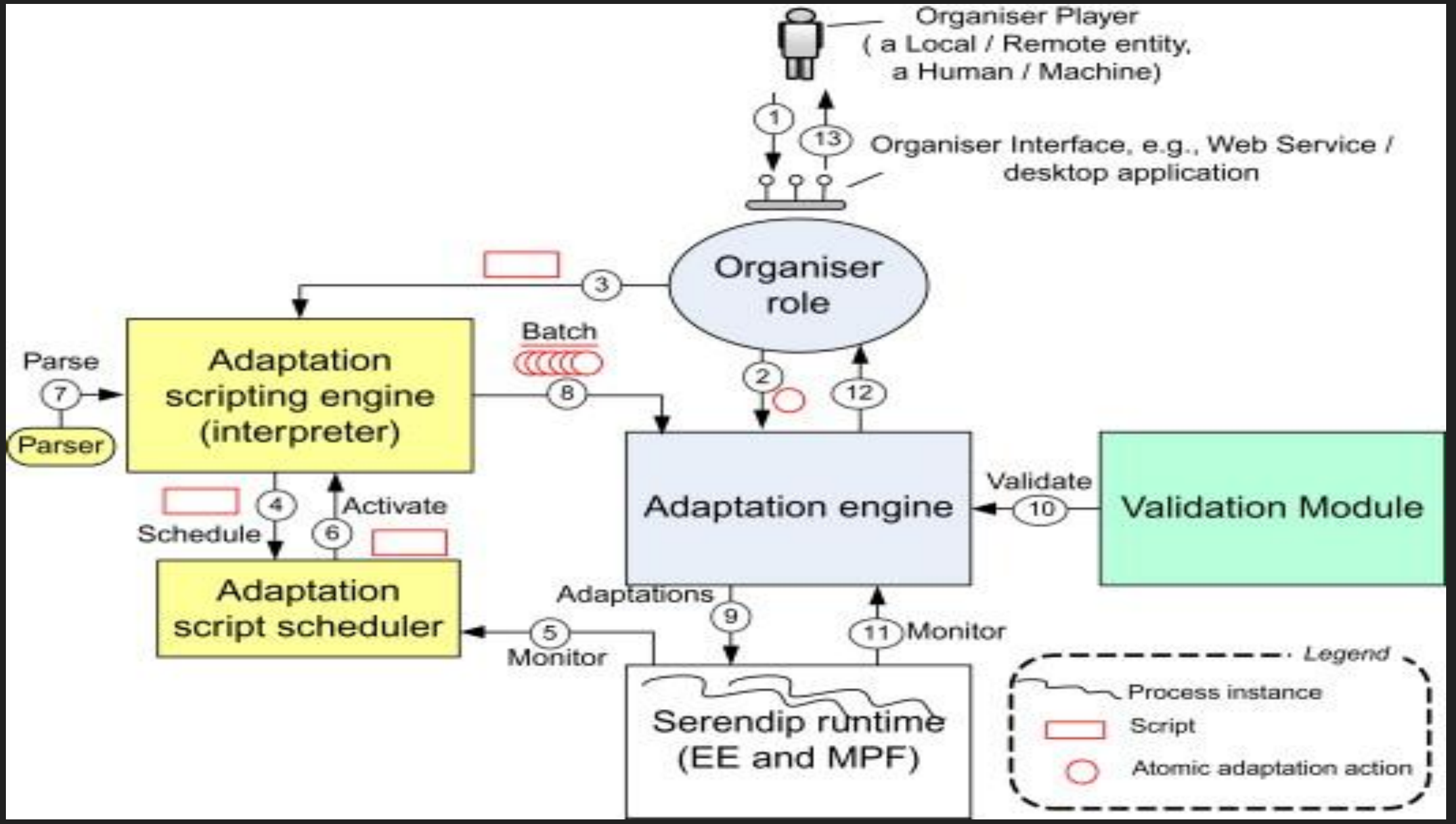
PRINCIPLE OF IDENTICAL ELEMENTS

The theory states that there is a positive correlation between the similarities between training and performance environments and the level of training transfer.

For example, in a cross-cultural awareness training arranging role playing games where individuals have to interact with the representatives of various cultural backgrounds in typical working environments would have a positive contribution to the levels of training transfer.

ADAPTATION MECHANISM

The objective of the adaptation engine is to assist the organiser player to carry out the adaptations on the service orchestration in a systematic manner. The design needs to support both the operation-based and batch mode adaptations (scheduled/not scheduled), ensuring the consistency among the two modes. In addition, the adaptation engine needs to operate as a separate subsystem addressing the management concerns from other subsystems (i.e. the enactment engine and model provider factory (MPF)) that address the functional concerns. The main components of the architecture are the organiser role, the adaptation engine, the adaptation scripting engine, the adaptation script scheduler and the validation module.


Organiser Player
(a Local / Remote entity,
a Human / Machine)
1
13
Organiser Interface, e.g., Web Service /
desktop application
Organiser
role
3
Batch
Parse
7
Parser
Adaptation
scripting engine
(interpreter)
8
2
12
Adaptation engine
Validate
10
Validation Module
Schedule
4
6
Activate
Adaptation
script scheduler
Adaptations
9
5
Monitor
11
Monitor
Serendip runtime
(EE and MPF)
Legend
Process instance
Script
Atomic adaptation action


THANK YOU!