

# CHAPTER 4

## MODELING ATTRIBUTES OF HUMAN BODY ORGANIZATION

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### 4.1 Introduction

All organizations, whether big or small, intend to achieve their goal optimally. But the challenges arise because of ever changing internal and external conditions which make this task more complex. Hence, managers are looking for models to take inspiration for better management for achieving goals optimally. In this regard, human body which is perfectly designed, organized and managed can be taken as a role model. Therefore, this chapter is an attempt to learn how business organization's can be managed effectively and efficiently by exploring the principles and processes found in Nature's best creation, i.e. the human body. The idea is to develop explanatory model of human body organization, which can be done by exploring the characteristics of human body which makes it perfect. For this purpose a framework has been taken from classical management functions viz. planning, organizing, directing and controlling. And for each of these managerial functions, comparisons are made between the human body and corporate organizations to develop parallels between them. The aforesaid comparison will reveal key attributes in human body which perhaps facilitate effective and efficient achievement of goals and which probably make it perfect. These attributes are then modeled using Interpretative Structural Modeling (ISM) to develop a generally applicable framework (which is later called human body organization model). The model developed demonstrates driving and dependence relationships between the identified attributes. Finally Analytic Hierarchy Process (AHP) is applied to determine relative importance of these attributes for effective and efficient achievement of goals. Based on this model few managerial insights are also proposed. These insights perhaps can help the organizations in significantly improving their structure and operating procedures which will enhance the performance of individuals as well as organization as a whole. A SAP-LAP framework of human body organization is also developed to derive insights by analyzing the actors and processes behind its perfections.

## 4.2 Objectives and tools/techniques used

The aim of this chapter is to develop a model representing human body organization, presuming it to be perfectly planned, organized, directed and controlled. The model developed must explain the key attributes behind human body perfection. The overall objective is divided into following sub-parts which involves use of different techniques as shown in Figure 4.1

- i. To identify parallels between the human body and business organizations in terms of four basic managerial functions viz. planning, organizing, directing and controlling. *Analogies and Metaphor Approach* has been used for this purpose.
- ii. To develop an explanatory model of human body organization (HBO) to analyze the crucial factors in an orderly manner. *ISM methodology* combined with *MICMAC Analysis* has been used to develop such model.
- iii. To determine the relative importance of each attribute of the HBO model. The *Analytic Hierarchy Process (AHP)* has been used to quantify the relative priorities of human body organization variables on a ratio scale based on the judgment of the experts.
- iv. To develop a framework suggesting actions for improving structure and operating procedures of organizations based on processes followed in human body. *SAP-LAP Analysis* has been applied for this purpose.

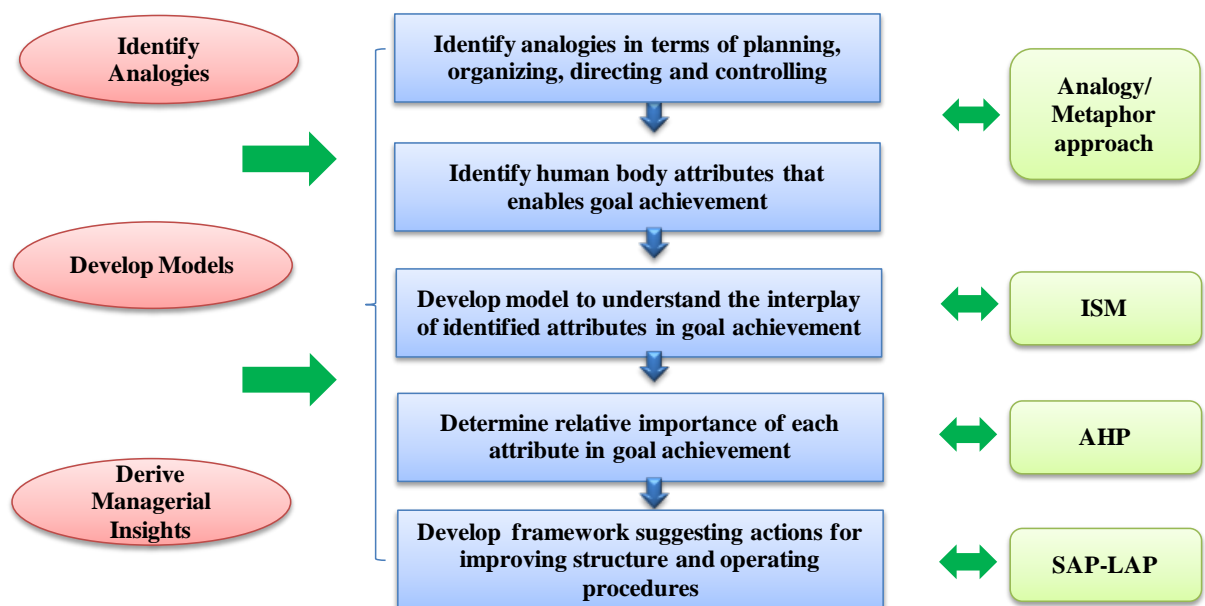


Figure 4.1: Broad steps involved in modeling with relevant technique

### **4.3 Identify analogies between human body and corporate organizations**

The human body is like a complex organization that has important jobs to do with stringent deadlines. It uses many sub-systems that work in tandem, in order to get everything done perfectly and on time; every time. The structure of human body is quite analogous to the structure of typical business organization wherein different subsystems and functional areas are arranged in similar patterns. The brain in human body functions like a unifying central guiding, directing and controlling agency of an organization. Furthermore, the ultimate aim of both human body and corporate organization is their healthy survival which requires synchronizing the plans with actions as directed by the brain or top agency in a controlled manner. Hence the key functions of management i.e. planning, organizing, directing and controlling are essential for all organizations and if these functions are approached scientifically, it would definitely lead to organizational success. Moreover, as already discussed that human body has always been managing itself in dynamically changing conditions, therefore it is expected that if the key attributes in human body can be identified, it would provide directions for managing organizations. This section is aimed to explore the four managerial functions in human body organization to identify its key attributes:

#### **4.3.1 Planning**

Planning is a preparatory step for action. To plan is to look ahead and chalk out the future course of action. According to Maheshwari [207] planning is essentially a process of making decisions in advance regarding future. In both human body organization and business organization planning is required to be done in a systematic way for determining future course of actions. In humans the planning process mainly includes pre-thinking the desired body growth and deciding the pattern to accomplish it. This is analogous to organizational planning which involves deciding the goals and course of action to achieve them. Other analogies can also be visualized between human body and corporate organizations; some of these are given in Table 4.1.

Table 4.1: Comparison of planning function in corporate body and human body

Corporate Body	Human Body
<p>Corporate planning is-</p> <ul style="list-style-type: none"> <li>• to decide organizational goals &amp; objectives.</li> <li>• the strategies to realize them.</li> <li>• plan for multiplication of resources to achieve goals &amp; objectives.</li> </ul>	<p>Planning in human body is pre-thinking-</p> <ul style="list-style-type: none"> <li>• desired body growth.</li> <li>• patterns to accomplish it.</li> <li>• plan for multiplication of cells to achieve growth.</li> </ul>
<p>It should involve plan for replenishment of resources and strategies in response to different external and internal stimuli like competitor's move, customer demand, technological up-gradation, etc.</p>	<p>It involves resumption of growth to heal the damage caused by external factors e.g. external or internal injury.</p> <p>It also involves deciding specific response to various external and internal stimuli e.g. fall/rise in temperature, air pressure etc.</p>
<p>Organizations also plan for :</p> <ul style="list-style-type: none"> <li>• Physical growth in terms of turnover, assets, resources, infrastructure, etc.</li> </ul>	<p>Growth planning that make up an individual also includes:</p> <ul style="list-style-type: none"> <li>• <i>Physical</i> (overall body) growth.</li> </ul>
<ul style="list-style-type: none"> <li>• Intellectual (mental) development, which includes trainings and development, work expertise of the overall organization.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Mental</i> (brain and mind development) growth.</li> </ul>
<p>Strong infrastructure and decision making capacity of strategy makers of the organization along with other factors determine growth of organizations.</p>	<p>Extent of physical and mental growth and development determines the body strength and brains intelligence, thoughts, actions, psychology, etc.</p>
<p>Maintaining ethical standards during strategic planning and implementation makes the culture of the organization healthy.</p>	<p>Mental development of an individual influences the thought process which in turn determines its cultural makeup.</p>

Table 4.1: Comparison of planning function in corporate body and human body

Corporate Body	Human Body
Organizational planning should aim to balance its intellectual and physical growth to achieve long term sustainability.	Mental development occurs gradually and physical growth occurs in all areas simultaneously to develop into an intelligent and healthy individual [324].
Planning should be done holistically by considering all subparts -as none can perform in isolation.	Planning is done <i>holistically</i> , wherein all individual sub-systems are planned not only for their internal physiology but also for all possible interactions.
<p>Co-ordination is necessary in businesses:</p> <ul style="list-style-type: none"> <li>• due to the interdependent nature of activities assigned to various departments.</li> <li>• Example: unless goods are produced in adequate quantities and at proper time, supply of goods to customers cannot be undertaken by sales department.</li> <li>• to avoid duplication, overlapping, and chaos in the organization.</li> </ul>	<p>In human body, goals of individual sub-systems are merged with overall purpose of body and they all work in a co-ordinate way to keep the body alive.</p> <ul style="list-style-type: none"> <li>• Example 1: nervous system and endocrine system work together to control and coordinate all our activities such as our physical actions, our thinking processes and our emotional behavior.</li> <li>• Example 2: the locomotive system of the body, where for even the smallest movement, skeletal system, muscles and nervous system must work in perfect collaboration.</li> </ul>
Contingency plans in response to certain unpredictable internal and external changes are also made. For example- sudden increase in customer demand.	Responses to sudden external and internal stimuli are pre-fed in the plan. Like release of insulin and suppression of glucagon in response to hyperglycemia [241].

### 4.3.2 Organizing

Organizing is a function in which the synchronization and combination of various resources like human, physical and financial, takes place. In human body such synchronization takes place between various sub-systems and their processes while handling different roles, like digestion process involves brain, digestive track and liver to work in synchronization to achieve the role. Similar synchronization can also be observed during body movements, respiration, etc. among various sub-systems.

Also a corporate body analogous to human body follows a specific pattern by which a large number of employees engaged in group efforts, relate and co-ordinate themselves with each other in a conscious and systematic manner for the accomplishment of a mutually agreed purpose. Other similarities can also be visualized between human body and corporate organization in the organizing function; some of which are given in Table 4.2.

Table 4.2: Comparison of organizing function in corporate body and human body

<b>Corporate Body</b>	<b>Human Body</b>
Organizations are primarily composed of employees.	The basic living unit of the body is the cell.
Employees with similar skill set perform related work, and form a team.	Organs and tissues are assemblies of many different cells performing similar functions [314].
<i>Structure</i> of the organization defines the way jobs are allocated, resources are deployed and sub-units are coordinated.	Its <i>structure</i> defines how activities are divided and various subsystems are coordinated.
<i>Structure</i> depends on the business profile, e.g. Subsystems of an industrial organization engaged in manufacturing and marketing of engineering goods will be production, marketing, financial (accounting), technology, HTD, HRD, etc	Human body structure is built on eleven major sub-systems that carry out the body's activities- integumentary, skeletal, muscular, nervous, endocrine, circulatory, respiratory, immune, digestive, urinary and reproductive.
Each subsystem or function is created for	A specific and essential job is assigned to

Table 4.2: Comparison of organizing function in corporate body and human body

Corporate Body	Human Body
a specific purpose.	each subsystem.
Dividing the organization into subunits: <ul style="list-style-type: none"> <li>• allows entire job to be broken down into several jobs.</li> <li>• utilizing specialization of individual employees in doing part of an activity rather than the entire activity.</li> </ul>	<i>Functional specialization</i> can be seen at all levels i.e. cellular, organ level, system level. <ul style="list-style-type: none"> <li>• e.g. red blood cells are specialized for the transportation of oxygen. Absence of nucleus in RBCs shows their incapability of reproducing [205].</li> </ul>
Inefficiency in functioning of any of the sub-unit may affect the other and thus the entire organization.	Malfunctioning in any of the subsystem may affect the other and thus the whole body.
<i>Structural model</i> of a common organization has line and staff functions to get better decisions using expertise of both.	Human body also comprises <i>line</i> and <i>staff</i> functions (refer Figure 4.2).
The <i>line function</i> comprises professionals who directly work toward accomplishing the organization's mission and goals. <ul style="list-style-type: none"> <li>• Example: sales group that initiates customer transactions.</li> </ul>	<i>Line function</i> includes: <ul style="list-style-type: none"> <li>• the involuntary organs (organs of growth, upkeep &amp; maintenance) like - stomach, heart, liver, kidney and,</li> <li>• the voluntary organs - arms, fingers, legs and feet (the organs with which we actually accomplish tasks or the organs over which the mind has control) [186].</li> </ul>
<i>Staff function</i> does not make a direct contribution to the firm but their actions help the line to work.	Its <i>staff function</i> has five senses (advisors) to provide inputs to the brain to decide what to do or not [186].

Table 4.2: Comparison of organizing function in corporate body and human body

Corporate Body	Human Body
<ul style="list-style-type: none"> <li>• Example: the human resources department ensures that the line is staffed with top-tier talent, legal advisors make sure that the actions of the line and its employees are within the scope of the law. Discrepancies can be seen between line and staff functions due to many reasons.</li> </ul>	<ul style="list-style-type: none"> <li>• it includes taste, touch, smell, hearing and sight.</li> </ul> <p>Both line function ('<i>karmendriya</i>') and staff function ('<i>gyanendriya</i>') operates in <i>holistic integration</i>.</p>
<p><i>Hierarchy</i> lies in all organizational structures to delegate powers at various levels. Table 4.3 shows the comparison of hierarchy in corporate and human body.</p> <ul style="list-style-type: none"> <li>• it defines, who within an organization reports to whom.</li> </ul>	<p><i>Hierarchy</i> also exists in human body as shown in Figure 4.3a &amp; b, where:</p> <ul style="list-style-type: none"> <li>• the lower or less complex subsystems “look up for purpose and down for function”.</li> </ul>
<ul style="list-style-type: none"> <li>• people at higher level look below for function and the people below look up for important decisions.</li> </ul>	<ul style="list-style-type: none"> <li>• for example, an individual cell serves an organ like a heart that, in turn serve the human body (organism). And, the organism looks to the less complex subsystems like heart for function and so on.</li> </ul>
<p>Hierarchy also serves as vital channel of communication.</p> <p>Each level of hierarchy carries distinctly different <i>type of communication</i>.</p>	<p>In human body cardiovascular system, the neural network, and the endocrine system, serves as vital <i>channels of flow</i>, exchanging chemical and electrical signals, and thus enabling the health and vitality of the whole.</p>
<p><b>Limitation:</b> According to Walton [362] most <i>organizations are bureaucratic</i> with:</p>	<p>It can also be visualized as <i>bureaucratic organization</i> wherein there are:</p>



Table 4.2: Comparison of organizing function in corporate body and human body

Corporate Body	Human Body
<ul style="list-style-type: none"> <li>• division of labour.</li> <li>• a rigid hierarchy.</li> <li>• administration based on written documents and adhering to general rules.</li> <li>• thorough and expert training of personnel.</li> <li>• full time commitment to official activities.</li> </ul>	<ul style="list-style-type: none"> <li>• clearly defined division of work.</li> <li>• hierarchal structure where duties attached to specific position.</li> <li>• DNA as written universal legal guideline prescribing performance criteria.</li> <li>• job allocation based on specialization e.g. reflexes for prompt response and mind for thought actuated response.</li> </ul>
<p>Literature reveals unintended <i>consequences of bureaucracy</i> like reduced organization efficiency because of adhering to specific rules and procedures in changing economic conditions.</p>	<p>Efficiency, adaptivity and promptness are the inherent characteristics of human body bureaucratic organization.</p>
<p>In business organizations, authority vests with top management like CEO and governing body.</p>	<p>Brain is the <i>central authoritative</i> body and it gives orders to effector organs for the appropriate response.</p>
<p>The employees have to follow the instructions given by person in authority.</p>	<p>All subsystems function based on the trigger and directions by the brain.</p>

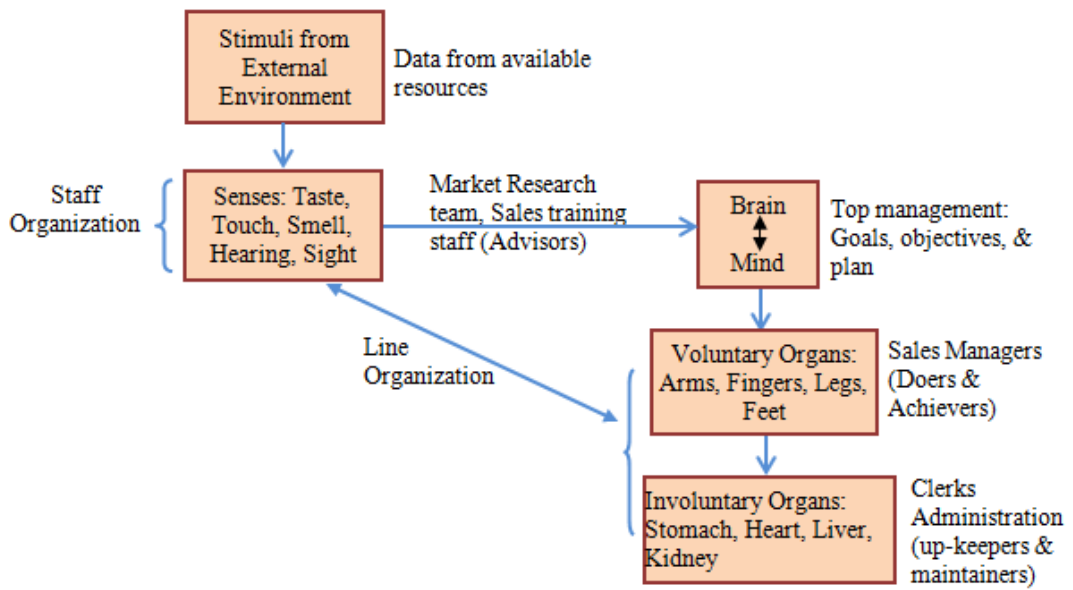


Figure 4.2: Line & staff functions of corporate body modeled from human body

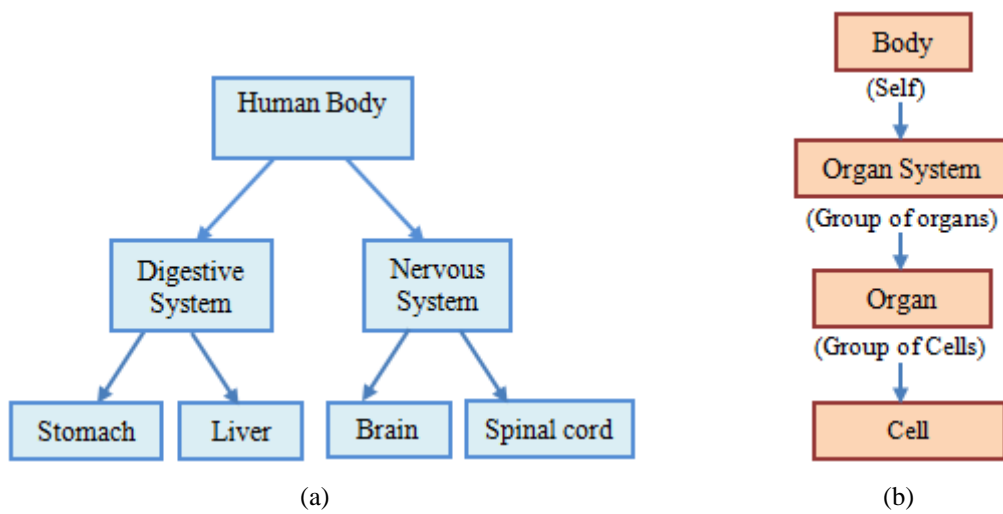


Figure 4.3 (a) & (b): Hierarchy in human body

Table 4.3: Comparison of hierarchy in corporate body and human body

Human Body Organization		Corporate Organization	
Level of organization	Explanation	Level of organization	Explanation
Cellular level	Cells are the smallest unit of life. Cells are enclosed by a membrane or cell wall and in multi cellular organism often perform specific functions. E.g. Blood cells, nerve cells.	Employees	A person with a set of skills or a person specialized in a specific job.
Tissue level	Tissues are group of cells with similar functions. E.g. Muscle, Epithelial and connective.	Work Team	A team of employees that have assigned to accomplish specific tasks.
Organ Level	Organs are two or more types of tissues that work together to complete a specific task. E.g. Heart, Liver, Stomach.	Department	Several teams with homogenous tasks, belonging to a specific department and representing a specific business function.
Organ sub-system level	An organ system is a group of organs that carries out more generalized set of functions. E.g. Digestive system, Circulatory system.	Strategic Business Unit( SBU)	A unit of people that is structured and managed to meet a need or to pursue collective goals.
Organism System	An organism has several organs as sub-systems that functions together. e.g. human	Organization	An organization has corporate business units that functions together.

### 4.3.3 Directing

Directing function is said to be the heart of management process and therefore, is the central point around which accomplishment of goals take place. Some philosophers call direction as “The life spark of an enterprise” [92]. It is also called as actuating function of management because it is through direction that the operation of an enterprise actually starts.

Human body and business organizations which are analogous to each other, use directing function in managing their operations effectively. Both organizations have a leader which provides guidance to its subsystems to perform effectively. Few more analogies between the two in their directing function are summarized in Table 4.4.

Table 4.4: Comparison of directing function in corporate body and human body

<b>Corporate Body</b>	<b>Human Body</b>
Manager as a leader supervises activities to accomplish the goals of the organization.	Brain as a leader guides individual organs and whole body for what to do.
For this purpose, overall activities are classified as strategic and operational.	For this purpose, overall activities/ tasks within the body are classified as involuntary and voluntary.
Top level managers act as brain of the organization who are responsible for strategic matters: <ul style="list-style-type: none"> <li>• which are critical in organizational success and can't be delegated.</li> <li>• Example: policy making decisions.</li> </ul>	Brain and autonomic nervous system are in-charge of involuntary functions: <ul style="list-style-type: none"> <li>• which are designed to occur in an reflexive manner.</li> <li>• their cost of failure/ delay is very high (vital for survival).</li> <li>• Example: digestion of food, breathing, heart beating, etc.</li> </ul>
Operational activities are delegated to the lower management. <ul style="list-style-type: none"> <li>• Routine in nature, and thus can be delegated. e.g. inventory control, sales</li> </ul>	Voluntary activities are guided by the mind. <ul style="list-style-type: none"> <li>• As their cost of failure/ delay is relatively low (essential for survival).</li> </ul>

Table 4.4: Comparison of directing function in corporate body and human body

Corporate Body	Human Body
transactions, etc.	e.g. food intake, etc.
Routine tasks are delegated while holding the power (control) to take non-routine strategic decisions.	Routine activities are autonomous or controlled so that body can use its mind for specific non routine activities like decision making, etc.
Performance of employees largely depends on leader's skills and leadership style followed.	Brain (and mind) as a leader considers various sources of information before deciding path of response at the effectors, as performance of various organs depends on it.
<b>Limitation:</b> Leader's impulsive decision may lead to system failure. e.g. assigning some responsibility to an individual without judiciously analyzing his suitability for the role.	Impulsive direction given by mind may harm the body critically. e.g. swallowing food without proper chewing.
Continuous learning can help a leader in mapping out the right procedure for goal achievement.	Wisdom and self control eliminates mind's impulsive decision making and makes it proficient in directing and managing the body.
<p>Process followed in directing:</p> <p>i) Directing starts with the orders and instructions by the top-level managers to the group managers, then from the group managers to the subordinate staff.</p>	<p><i>Process followed in directing:</i></p> <p>i) The body sensors acting as input provider (touch, taste, smell, hearing and sight) informs about those particular facts that may be useful to the directing brain. ii) The leading brain which is not in direct contact with the outside world, provide direction to the various organs to take appropriate action on the basis of this information only.</p>

Table 4.4: Comparison of directing function in corporate body and human body

<b>Corporate Body</b>	<b>Human Body</b>
<p>ii) The subordinate staff then passes the instructions to the supervisors of the concerned departments like product design, pricing, branding, promotion, etc. who makes sure that the task is done accurately and to perfection.</p>	<p>iii) Organs of achievement like - hands, feet, finger, legs and feet are then activated in doing or carrying out the orders of the brain (the directing agency).</p>
<p>A manager uses motivation as a tool here to improve the performances of subordinates.</p> <p>This can be done by providing incentives or compensation (monetary or non – monetary), which serves as a “Morale booster” to the subordinates</p>	<p>In human body, all subsystems are self motivated and their goals are attached with organizational goal.</p> <p>They do not require any external motivation.</p>
<p>Communication is a source of information sharing, motivation, socializing, etc.</p>	<p>Communication between various sub-systems is vital to keep the body in balance (through homeostasis).</p>
<p>Thus manager should develop and maintain an effective communication system in the organization.</p> <p>A manager must discover various barriers to communication and analyze the reasons for their occurrence and take preventive steps to avoid those barriers.</p>	<p>Through communication, organs neither underwork nor overwork, and each organ facilitates the functions of every other organ.</p> <p>For example, the kidneys must know when the body has too much fluid, so that they can produce more dilute urine, and when the body is dehydrated, so that they can conserve water.</p>

#### 4.3.4 Controlling

Controlling is the management function that minimizes deviations from standards by checking the deviations and taking corrective action so that stated goals of the organization are achieved in a desired manner.

*"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it, you can't control it. If you can't control it, you can't improve it. "- H. James Harrington*

The human body offers us a complex yet powerful control mechanism. The human body is a complex network of vital organs that function as an integrated whole under normal conditions. The functional parameters of the body conform to "norms" usually expressed as a range. When these parameters are within acceptable range the body is considered to be normal. When they are not within "norm", a signal affecting some intervention may be necessary (e.g. blood pressure). Homeostasis mechanism (through nervous and endocrine system) intervenes in such conditions to raise or alter the conditions to ascertain that the body is functioning normally. The same can be said of the corporate body. If the performance is within a normal range; no action is required.

Unlike the human body there are no standard norms for a corporate body. Each organization is unique and has its own norms. The chief executive measures the condition of an organization through key performance indicators (e.g. KPI). So, a deviation from desired performance in key performing areas can be understood as imbalance or in-equilibrium and require a management control system. Apart from it, change in external condition may also require control to come into action. Therefore control system in human body can be considered analogous to that in a corporate body. Analogies between the two are summarized in Table 4.5:

Table 4.5: Comparison of Control functions in corporate body and human body

Corporate Body	Human Body
<p>Control is exerted: i) locally, at departmental level e.g. controlling performance of employees and ii) organization wide wherein various departments are coordinated with each other and with the external environment to achieve common goal, e.g. replenishing inventory according to customer needs.</p>	<p>Homeostasis control mechanism operate i) locally (<i>intrinsic mechanism</i>) to protect a specific organ only, e.g. O<sub>2</sub> balance in muscle cells during exercise and ii) body wide (<i>extrinsic mechanism</i>) which permits coordinated regulation of several organs towards common goal, e.g. regulation of blood pressure, blood glucose, etc. for healthy survival of body.</p>
<p>Feedback, feed forward and concurrent control can allow slowing down unnecessary and disruptive activities that is likely to hurt the organization in the long run.</p>	<p>Homeostasis in human body terminates unnecessary and unruly growth or manages to abandon the body's deviation from normal state through <i>feedback, feed forward and concurrent control mechanism</i>.</p>
<p>Feedback mechanism in organizations:</p>	<p>Feedback control mechanism in human body:</p>
<ul style="list-style-type: none"> <li>• Handles situations like employee performance appraisal, customer feedbacks, competitors move, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Applies where the response is made after a change has been detected. e.g. clot formation when a blood vessel is damaged.</li> </ul>
<p>Feed forward or proactive control:</p> <ul style="list-style-type: none"> <li>• Protects the organization from unexpected situations like attrition, inventory stock-out, etc.</li> </ul>	<p>Feed forward control mechanism:</p> <ul style="list-style-type: none"> <li>• Acts in anticipation of a change in a regulated variable like insulin secretions that help in nutrient digestion and absorption to limit the rise in blood nutrient concentration.</li> </ul>



Table 4.5: Comparison of Control functions in corporate body and human body

Corporate Body	Human Body
<p>Concurrent control mechanism:</p> <ul style="list-style-type: none"> <li>• Managers constantly monitor the situations to sense, communicate and direct their sub-systems and control to avoid deviations from standards concurrently.</li> </ul>	<p>Concurrent control mechanism:</p> <ul style="list-style-type: none"> <li>• Body is equipped with self healing mechanism that helps the body to maintain a life sustaining balance. e.g. automatic wound healing.</li> </ul>
<p>Feedback in helps to improve performance, guarantees realization of standards and communicate important business objectives.</p> <p>It comes in two forms, positive feedback and negative feedback.</p>	<p>Feedback (positive and negative) mechanisms performs the vital function of making the human body relatively insensitive to internal or external disturbances, thus enabling it to function properly in changing environment.</p>
<p>Negative feedback is a corrective adjustment. e.g. when someone is performing inappropriately and telling him how to change it.</p>	<p>Negative feedback corrects the deviations from the normal desired level. e.g. a rise in body temperature is corrected by sweating (thermoregulation).</p>
<p>It can involve attitudinal, behavioral or other aspects.</p>	
<p>Positive feedback is used to appraise the employee's performance so that the person will likely repeat the behavior to secure continued approval.</p>	<p>With positive feedback, output enhances a change to push the mechanism to move in the direction of initial change. e.g. release of oxytocin during birth of a child.</p>
<p>Feedback is executed through performance appraisal of employees which in turn depends on the management policies towards it.</p>	<p>The cells (as employees) that are deteriorated or not healthy to perform normal functions are subject to self elimination [178].</p>

The above analogies are only illustrative not exhaustive, but it is clear that there are strong parallels between human and corporate bodies. However, similarity in their performance is missing as human body is better managed than corporate bodies.

Following are some of the major characteristics of human body from the above comparison that probably makes it a perfectly designed, organized and managed system, which facilitate effective and efficient goal achievement.

- i. Holistic, yet flexible in planning for growth.
- ii. Physical and mental growth takes place simultaneously and maintains an optimal balance between them.
- iii. Line and staff functions can be seen to work in perfect harmony with no status related discrepancies.
- iv. Human body structure is rule based, system driven (process based), yet prompt and flexible.
- v. Optimal degree of transparency; as all the relevant information is available to each unit in the form of DNA.
- vi. All sub-systems co-ordinate with each other to work as a team to achieve long term healthy survival.
- vii. Flawless communication as there are multiple flows for exchanging vital information and materials.
- viii. Functional specialization at all levels.
- ix. Brain is a central guiding authority which eliminates duplication and prevents conflict of instructions to be followed among various constituents.
- x. An optimal balance between autonomy and control; as routine activities are controlled through automation. It allows autonomy to lie with more important strategic decisions.
- xi. Separate authority for operational and strategic decisions in the form of brain and mind, respectively.
- xii. Self motivation or inherent willingness of all sub-systems to perform.
- xiii. Equipped with a control mechanism- homeostasis, that is able to maintain internal dynamic equilibrium by making necessary adjustments.
- xiv. A Self healing mechanism to maintain a life sustaining balance.
- xv. Cell suicide mechanism or self elimination of non-performers to manage performance of individual employees.

## 4.4 Modeling attributes of human body organization

Attributes essential for effective and efficient goal achievement have been drawn from the above discussions. Moreover, if we consider all the attributes independently to understand the issue, they seem equally important. This creates a situation where it becomes difficult to have a clear and holistic view of the problem. However, by developing direct and indirect relationships the situation can be described far more accurately than by taking each attribute in isolation. Hence, it necessitates selecting a methodology that can help in identifying a structure within a system, with which the problem can be articulated in a clear fashion. Purpose of developing a model is to understand the enablers and their interplay which makes human body a perfect organization.

### 4.4.1 Methodology

Interpretive Structural Modeling (ISM) has been applied for identifying and summarizing relationships among specific human body attributes, which define optimal goal achievement in it [282, 363]. ISM provides means by which order can be imposed on the complexity of such variables [210]. MICMAC (Matrice d'Impacts Croisés Multiplication Appliquée á un Classement) analysis of proposed ISM provides insight into the impact of attributes on the total human body system. The basic process of ISM followed is presented briefly in a step-by-step manner using the elements of human body organization.

**Step I: Identify and define elements:** The attributes responsible for making human body as perfectly planned, organized, directed and controlled system have been identified in previous sections and are listed in Table 4.6.

Table 4.6: Attributes of human body organization in goal achievement

S. No.	Attributes\Variables	Abbreviations	Element Code
1	Holistic & flexible planning	H&FP	E1
2	Balance in physical & intellectual growth	BPIG	E2
3	No line & staff function conflict	NLSC	E3
4	Rule based & system driven	RSS	E4

S. No.	Attributes\Variables	Abbreviations	Element Code
	structure		
5	Optimal degree of transparency	ODT	E5
6	Co-ordination & team work	C&TW	E6
7	Multiple flows of communication	MFC	E7
8	Functional specialization	FS	E8
9	Brain as central authority	BCA	E9
10	Optimally balanced autonomy & control	OA&C	E10
11	Separate authority for operational & strategic decisions	SAO&SD	E11
12	Self motivated sub-systems	SMSS	E12
13	Presence of homeostatic control mechanism	HCM	E13
14	Self healing ability	SHA	E14
15	Self elimination of non-performers	SE	E15

**Step II: Structural self-interaction matrix (SSIM):** For analyzing the interplay of the variables on human body, a contextual relationship is established through expert panel opinion and discussion sessions held with them. The experts chosen are from the industry and academia and are well conversant with the problem under consideration. The relationship between any two variables (denoted by i and j) is considered and direction of the relationship is depicted by the following four symbols V, A, X and O in SSIM Table 4.7.

Table 4.7: Structural self-interaction matrix (SSIM)

$\begin{matrix} i \\ \downarrow \\ j \end{matrix}$	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1	V	O	V	O	V	V	A	V	V	V	O	V	V	V
2	O	O	O	O	O	O	O	O	O	O	O	O	O	
3	O	O	O	O	O	O	A	A	A	V	A	A		
4	V	O	V	O	A	V	A	V	O	V	O			
5	V	V	O	V	O	O	O	V	O	O				
6	V	V	V	A	O	O	A	A	A					
7	O	O	O	O	O	O	O	O						
8	O	O	X	O	V	V	O							
9	O	V	V	O	X	V								
10	V	V	V	O	V									
11	V	V	V	O										
12	V	V	O											
13	V	V												
14	A													

V-variable i will help to achieve variable j;

A-variable i will be achieved by variable j;

X-variables I and j will help achieve each other; and

O-variables j and I are unrelated.

The following statements explain the use of symbols V, A, X and O in SSIM (refer Table 4.7):

- i. A holistic and flexible planning approach (1) helps in self elimination by non performers (15); hence V is assigned to the cell at intersection of holistic & flexible planning row and self elimination of non performers' column.
- ii. Holistic and flexible planning (1) is possible because of presence of brain as central authority (9); hence A is assigned in the cell at the intersection of brain as central authority row and holistic and flexible planning column.
- iii. Also as per the experts opinion holistic and flexible planning (1) and self healing ability in organization (14) are unrelated; therefore O is assigned to cell at interaction of row of imbalance in distribution of authority and Self healing ability.
- iv. Similarly, functional specialization (8) and homeostatic control mechanism (13) helps in achieving each other, therefore X is assigned in the cell at the

intersection of functional specialization row and presence of homeostatic control mechanism column.

**Step III: Reachability matrix and transitivity check:** The SSIM matrix is transformed into initial reachability matrix by converting the information in each entry of the SSIM into 1s and 0s in the initial reachability matrix. Initial reachability matrix for the variables prepared is shown in Table 4.8.

The substitution is made as follows:

- i. If the (i,j) entry in the SSIM is V, then the (i,j) entry in the reachability matrix is 1 and the (j,i) entry becomes 0.
- ii. If the (i,j) entry in the SSIM is A, then the (i,j) entry in the matrix is 0 and the (j,i) entry becomes 1.
- iii. If the (i,j) entry in the SSIM is X, then the (i,j) entry in the matrix is 1 and the (j,i) entry also becomes 1.
- iv. If the (i,j) entry in the SSIM is O, then the (i,j) entry in the matrix is 0 and the (j,i) entry also becomes 0.

Table 4.8: Initial reachability matrix

$\begin{matrix} i \rightarrow \\ \downarrow \\ i \end{matrix}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1
2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
4	0	0	1	1	0	1	0	1	0	1	0	0	1	0	1
5	0	0	1	0	1	0	0	1	0	0	0	1	0	1	1
6	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
7	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
8	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0
9	1	0	1	1	0	1	0	0	1	1	1	0	1	1	0
10	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1
11	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1
12	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1
13	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Note: \* indicates transitive relationships

1\* entries are included to incorporate transitivity to fill the gap, if any, in the opinion collected during development of SSIM. After incorporating the transitivity, the final reachability matrix is obtained in Table 4.9.

Table 4.9: Final reachability matrix

$\begin{matrix} \rightarrow \\ i \\ \downarrow \end{matrix}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	1	1	1	0	1	1	1	1*	1	1	0	1	1*	1
2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	1	0	0	1	0	0	0	0	0	0	1*	1*	1*
4	0	0	1	1	0	1	0	1	0	1	1*	0	1	1*	1
5	0	0	1	0	1	1*	0	1	0	1*	1*	1	1*	1	1
6	0	0	0	0	0	1	0	1*	0	0	0	0	1	1	1
7	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
8	0	0	1	1*	0	1	0	1	1*	1	1	0	1	1*	1*
9	1	0	1	1	0	1	0	1*	1	1	1	0	1	1	1*
10	0	0	0	1*	0	0	0	1*	1*	1	1	0	1	1	1
11	0	0	0	1	0	0	0	1*	1	0	1	0	1	1	1
12	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1
13	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

**Step IV: Partitioning the reachability matrix:** From the final reachability matrix, for each variable, reachability set and antecedent sets are derived. The reachability set represents the variable itself and the other variable that it may impact, whereas the antecedent set consists of the variable itself and the other variable that may impact it. In the present case, the variables along with their reachability set, antecedent set, interaction set and the levels are shown in Table 4.10.

Table 4.10: Partitioning the reachability matrix

Iteration	Variable	Reachability Set	Antecedent Set	Intersection	Level		
I	1	1,2,3,4,6,7,8,9,10,11,13,14,15	1,9	1,9	I		
	2	2,	1,2	2			
	3	3,6,13,14,15	1,3,4,5,7,8,9	3			
	4	3,4,6,8,10,11,13,14,15	1,3,4,5,7,8,9	3,4,8			
	5	3,5,6,8,10,11,12,13,14,15	5	5			
	6	6,8,13,14,15	1,3,4,5,6,7,8,12	6,8,			
	7	3,6,7	1,7	7			
	8	3,4,6,8,9,10,11,13,14,15	1,4,5,6,8,9,10,11,13	4,6,8,9,10,11,13			
	9	1,3,4,6,8,9,10,11,13,14,15	1,8,9,10,11	1,8,9,10,11			
	10	4,8,9,10,11,13,14,15	1,4,5,8,9,10	4,8,9,10			
	11	4,8,9,11,13,14,15	1,4,5,8,9,10,11	4,8,9,11			
	12	6,12,14,15	5,12	12			
	13	8,13,14,15	1,3,4,5,6,8,9,10,11,13	8,13			
	14	14	1,3,4,5,6,8,9,10,11,12,13,14,15	14			
	15	14,15	1,3, 4,5,6,8,9,10,11,12,13,15	15			
II	1	1,3,4,6,7,8,9,10,11,13,15	1,9	1,9	II		
	3	3,6,13,15	1,3,4,5,7,8,9	3			
	4	3,4,6,8,10,11,13,15	1,3,4,5,7,8,9	3,4,8			
	5	3,5,6,8,10,11,12,13,15	5	5			
	6	6,8,13,15	1,3,4,5,6,7,8,12	6,8,			
	7	3,6,7	1,7	7			
	8	3,4,6,8,9,10,11,13,15	1,4,5,6,8,9,10,11,13	4,6,8,9,10,11,13			
	9	1,3,4,6,8,9,10,11,13,15	1,8,9,10,11	1,8,9,10,11			
	10	4,8,9,10,11,13,15	1,4,5,8,9,10	4,8,9,10			
	11	4,8,9,11,13,15	1,4,5,8,9,10,11	4,8,9,11			
	12	6,12,15	5,12	12			
	13	8,13,15	1,3,4,5,6,8,9,10,11,13	8,13			
	15	15	1,3, 4,5,6,8,9,10,11,12,13,15	15			
	III	1	1,3,4,6,7,8,9,10,11,13	1,9		1,9	III
		3	3,6,13	1,3,4,5,7,8,9		3	
4		3,4,6,8,10,11,13	1,3,4,5,7,8,9	3,4,8			
5		3,5,6,8,10,11,12,13	5	5			
6		6,8,13	1,3,4,5,6,7,8,12	6,8,			
7		3,6,7	1,7	7			
8		3,4,6,8,9,10,11,13	1,4,5,6,8,9,10,11,13	4,6,8,9,10,11,13			
9		1,3,4,6,8,9,10,11,13	1,8,9,10,11	1,8,9,10,11			
10		4,8,9,10,11,13	1,4,5,8,9,10	4,8,9,10			
11		4,8,9,11,13	1,4,5,8,9,10,11	4,8,9,11			
12		6,12	5,12	12			
13		8,13	1,3,4,5,6,8,9,10,11,13	8,13			
IV		1	1,3,4,6,7,8,9,10,11	1,9	1,9	IV	
	3	3,6	1,3,4,5,7,8,9	3			
	4	3,4,6,8,10,11	1,3,4,5,7,8,9	3,4,8			
	5	3,5,6,8,10,11,12	5	5			
	6	6,8	1,3,4,5,6,7,8,12	6,8			
	7	3,6,7	1,7	7			
	8	3,4,6,8,9,10,11	1,4,5,6,8,9,10,11	4,6,8,9,10,11			
	9	1,3,4,6,8,9,10,11	1,8,9,10,11	1,8,9,10,11			
	10	4,8,9,10,11	1,4,5,8,9,10	4,8,9,10			
	11	4,8,9,11	1,4,5,8,9,10,11	4,8,9,11			
	12	6,12	5,12	12			



Table 4.10: Partitioning the reachability matrix

Iteration	Variable	Reachability Set	Antecedent Set	Intersection	Level		
V	1	1,3,4,7,8,9,10,11	1,9	1,9	V		
	3	3	1,3,4,5,7,8,9	3			
	4	3,4,8,10,11	1,3,4,5,7,8,9	3,4,8			
	5	3,5,8,10,11,12	5	5			
	7	3,7	1,7	7			
	8	3,4,8,9,10,11	1,4,5,8,9,10,11	4,8,9,10,11			
	9	1,3,4,8,9,10,11	1,8,9,10,11	1,8,9,10,11			
	10	4,8,9,10,11	1,4,5,8,9,10	4,8,9,10			
	11	4,8,9,11	1,4,5,8,9,10,11	4,8,9,11			
	12	12	5,12	12			
	VI	1	1,4,7,8,9,10,11	1,9		1,9	VI
		4	4,8,10,11	1,4,5,7,8,9		4,8	
5		5,8,10,11	5	5			
7		7	1,7	7			
8		4,8,9,10,11	1,4,5,8,9,10,11	4,8,9,10,11			
9		1,4,8,9,10,11	1,8,9,10,11	1,8,9,10,11			
10		4,8,9,10,11	1,4,5,8,9,10	4,8,9,10			
11		4,8,9,11	1,4,5,8,9,10,11	4,8,9,11			
VII	1	1,4,9,10	1,9	1,9	VII		
	4	4,10	1,4,5,7,9	4			
	5	5,10	5	5			
	9	1,4,9,10	1,9,10	1,9,10			
	10	4,9,10	1,4,5,9,10	4,9,10			
VIII	1	1,4,9	1,9	1,9	VIII		
	4	4	1,4,5,7,9	4			
	5	5	5	5			
	9	1,4,9	1,9	1,9			
IX	1	1,9	1,9	1,9	IX		
	9	1,9	1,9	1,9			

The intersection of these sets is then derived. The top level in the ISM hierarchy is occupied by the variables for which the reachability and the intersection sets are the same. These variables will not lead the other variables above their own level and once identified, they are removed from consideration. Then, the same process is repeated to find out the variables in the next level. This process is continued until the level of each variable is found. In this way the entire process is completed in nine iterations and nine levels have been identified as follows Table 4.11:

Table 4.11: Final level of elements

Element code	Element name	Levels in ISM
E2	Balance in physical & intellectual growth	I
E14	Self healing ability	I
E15	Self elimination of non-performers	II
E13	Presence of homeostatic control mechanism	III
E6	Co-ordination & team work	IV
E3	No line & staff conflict	V
E12	Self motivated sub-systems	V
E7	Multiple flows of communication	VI
E8	Functional specialization	VI
E11	Separate authority for operational & strategic decisions	VI
E10	Optimally balanced autonomy & control	VII
E4	Rule based & system driven structure	VIII
E5	Optimal degree of transparency	VIII
E1	Holistic & flexible planning	IX
E9	Brain as central authority	IX

**Step VI: Developing conical matrix:** Conical matrix is developed by clustering factors in the same level across the rows and columns of the final reachability matrix. The driving power of a factor is derived by summing up the number of 1s in the rows and its dependence power by summing up the number of 1s in the columns. The driving power and dependence power ranks are calculated by giving highest ranks to the factors that have the maximum number of 1s in the rows and columns respectively. The Matrix is in the form of Table 4.12 and Table 4.13.

Figure 4.12: Conical form of reachability matrix

Element	2	14	15	13	6	3	12	7	8	11	10	4	5	1	9
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0
6	0	1	1	1	1	0	0	0	1	0	0	0	1	0	0
3	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
12	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0
8	0	1	1	1	1	1	0	0	1	1	1	1	0	0	1
11	0	1	1	1	0	0	0	0	1	1	0	1	0	0	1
10	0	1	1	1	0	0	0	0	1	1	1	1	0	0	1
4	0	1	1	1	0	1	0	0	1	1	1	1	0	0	0
5	0	1	1	1	1	1	1	0	1	1	1	0	1	0	0
1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1
9	0	1	1	1	1	1	0	0	0	1	1	1	0	1	1

Table 4.13: Conical form of reachability matrix with driving power and dependence of various elements

Element	2	14	15	13	6	3	12	7	8	11	10	4	5	1	9	Driving power	Rank
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	X
14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	X
15	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	IX
13	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	4	VII
6	0	1	1	1	1	0	0	0	1	0	0	0	1	0	0	6	V
3	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	5	VI
12	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	4	VII
7	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	3	VIII
8	0	1	1	1	1	1	0	0	1	1	1	1	0	0	1	10	II
11	0	1	1	1	0	0	0	0	1	1	0	1	0	0	1	7	IV
10	0	1	1	1	0	0	0	0	1	1	1	1	0	0	1	8	III
4	0	1	1	1	0	1	0	0	1	1	1	1	0	0	0	8	III
5	0	1	1	1	1	1	1	0	1	1	1	0	1	0	0	10	II
1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	13	I
9	0	1	1	1	1	1	0	0	0	1	1	1	0	1	1	10	II
Dependence	2	13	12	10	8	7	2	2	8	7	6	6	2	2	5		
Rank	VIII	I	II	III	IV	V	VIII	VIII	IV	V	VI	VI	VIII	VIII	VII		

**Step VII: Development of digraph:** From the conical form of reachability matrix, the preliminary digraph including transitive links is obtained. After removing the indirect links, a final digraph is developed in Figure 4.4.

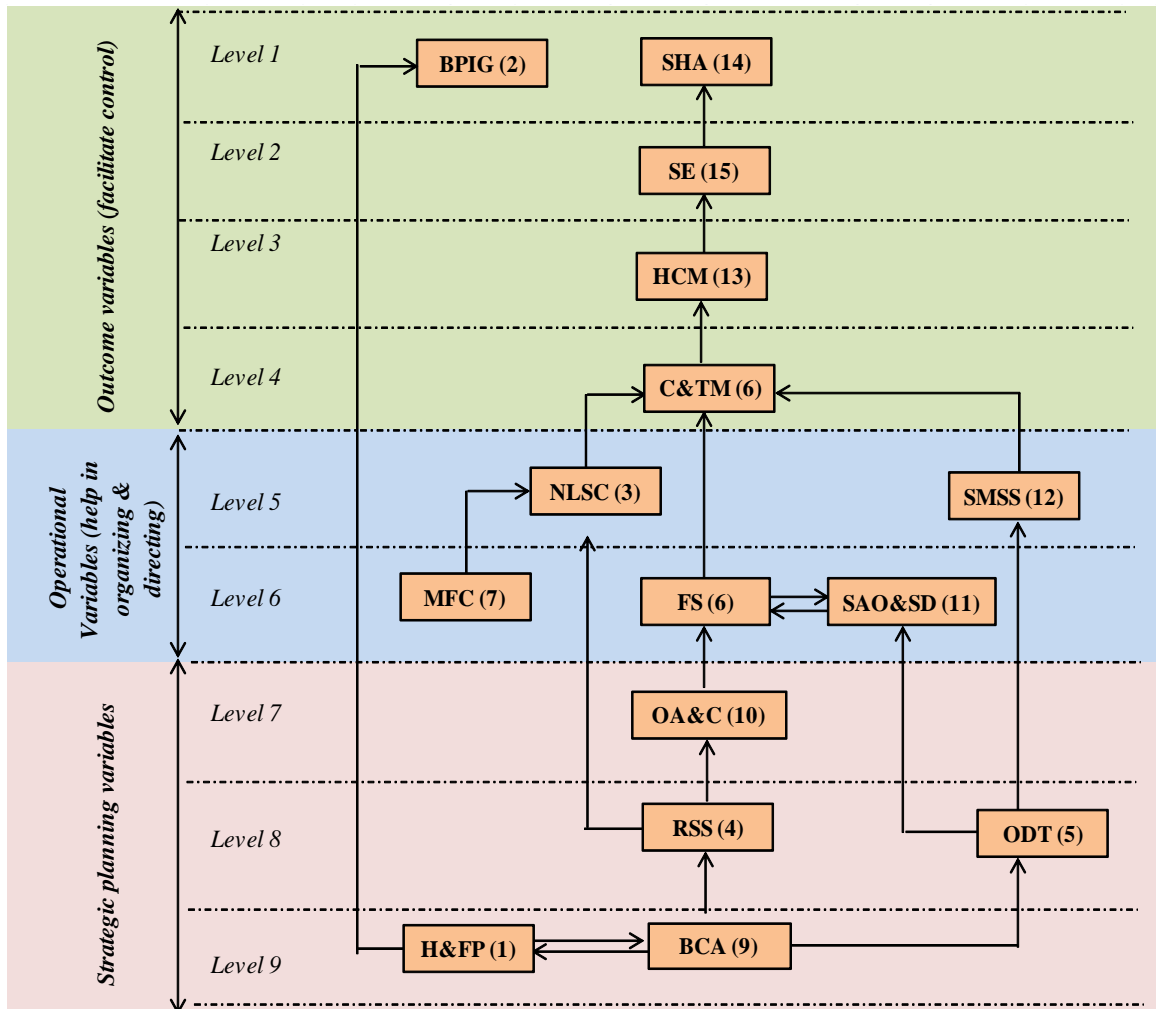


Figure 4.4: ISM- based model of the variables for understanding interplay of human body attributes in goal achievement

#### 4.4.2 MICMAC analysis

The objective of MICMAC analysis is to analyze the driving and dependence power of the attributes of the human body. MICMAC analysis classifies the attributes as autonomous, linkage, dependent and independent variables on the basis of their driving and dependence power. The four clusters in MICMAC for human body organization are shown in Figure 4.5.

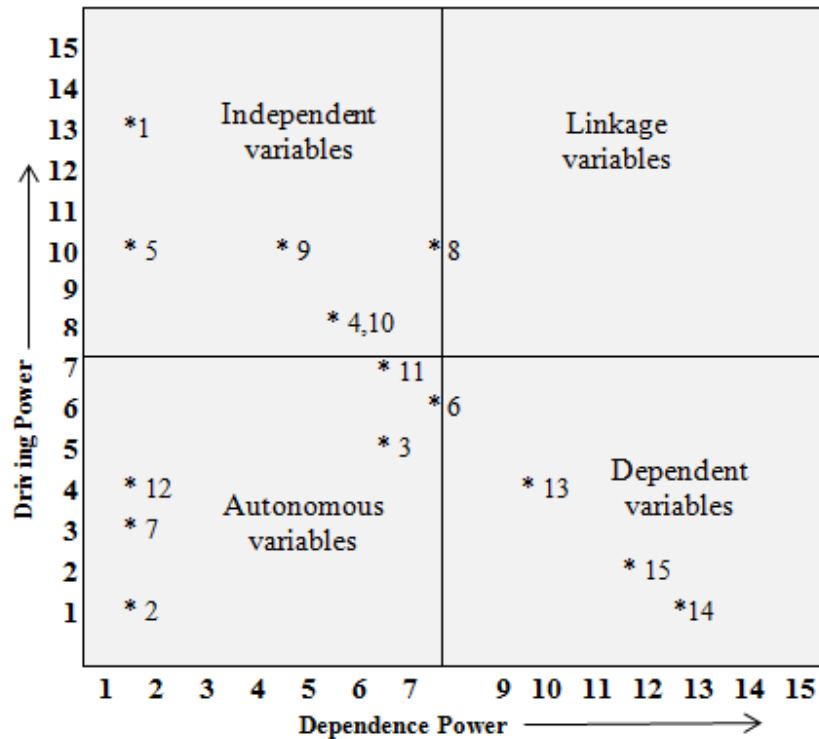


Figure 4.5: Cluster of attributes inducing goal achievement

#### 4.4.3 Interpretations from digraph and MICMAC analysis

The resulting framework has categorized the attributes as planning (strategic), organizing and directing (operational) and control (performance). The interpretations were made by combining the results of ISM technique (demonstrated through digraph) and the MICMAC analysis. The independent, dependent and linkage variables in MICMAC analysis correspond to the strategic (or planning) variables, outcome (or control) variables and operational (organizing and directing) variables respectively. The interpretations are summarized as follows:

- i. The digraph in Figure 4.4 has divided the hierarchy of 15 variables into 9 levels. The lower level of the hierarchy represents strategic variables. We are labeling them as planning variables because of their importance at the planning stage of management process. Middle level of hierarchy corresponds to organizing and directing phase of management process as they are the linkage between planning and outcome. The top level variables are performance outcomes, the one which depend on sound planning, organizing and directing for achieving the good. They exhibit the final outcome i.e. effective and efficient management and therefore are called control variables.

- ii. As per the digraph, the five variables - H&FP (1), BCA (9), ODT (5), RSS (4) and OA&C (10) appearing at levels VII, VIII and IX and are grouped as planning variables play a very critical role in effective and efficient management of human body organization. Furthermore the outcomes of MICMAC analysis support the results. Moreover, even in human body holism is the key driver which regulates overall body with the help of brain [11]. Here we can conclude that the managers should consider and incorporate these variables while formulating strategies.
- iii. Four variables- SHA (14), SE (15), HCM (13) and C&TW (6) appear at levels I, II, III and IV respectively. They have very weak driving power but have a very strong dependence on other variables down the hierarchy. They are lying in the cluster of dependent variables in driving-dependence diagram. In fact major performance outcome in human body is its ability to heal itself, ability to remove dead cells and homeostasis mechanism [285].
- iv. As per the digraph, level V and VI are represented by the five variables SMSS (12), NLSC (3), SAO&SD (11), FS (8) and MFC (7) which must serve as linkage between the strategic and performance variables. However as per MICMAC analysis, except FS (8) these variables have weak driving and dependence power. Such variables (called autonomous variable) are relatively disconnected and bear no significant relevance to the system, therefore shall be ignored. Only variable FS (8) which has moderate driving and dependence power, appearing in linkage variable cluster of MICMAC is a linkage variable. The managers can directly work on such variables for optimal management of organizations.

## **4.5 Determining relative importance of attributes of human body organization using AHP**

### **4.5.1 Methodology**

ISM has been used to evolve mutual relationships among the attributes of human body organization. It also defines order and direction on the complex relationships among the HBO attributes. However, outcomes of ISM methodology are limited to identifying major drivers among these attributes. Therefore, in order to quantify or weigh the significance of each attribute, Analytic Hierarchy Process (AHP) can be applied. It is expected that the derivation of relative weight of each human body

attribute will provide insights to managers in setting priorities and will also suggest key focus areas.

AHP modeling process involves structuring the decision problem, measurement of preferences, determination of normalized weights and synthesis. Following are the basic steps in accomplishing AHP:

**Step I: Structuring the hierarchy of goal achievement in HBO:** The structure of the system is developed with the help of digraph obtained with through ISM procedure as is shown in Figure 4.6 First level of hierarchy contains the macro goal, which is optimal achievement of organization goals. The next level contains stages in goal achievement (i.e. i. planning, ii. organizing & directing, and iii. controlling), which contribute to the goal at macro level. The last level contains variables or attributes corresponding to each stage, out of which key focus areas are aimed to be identified.

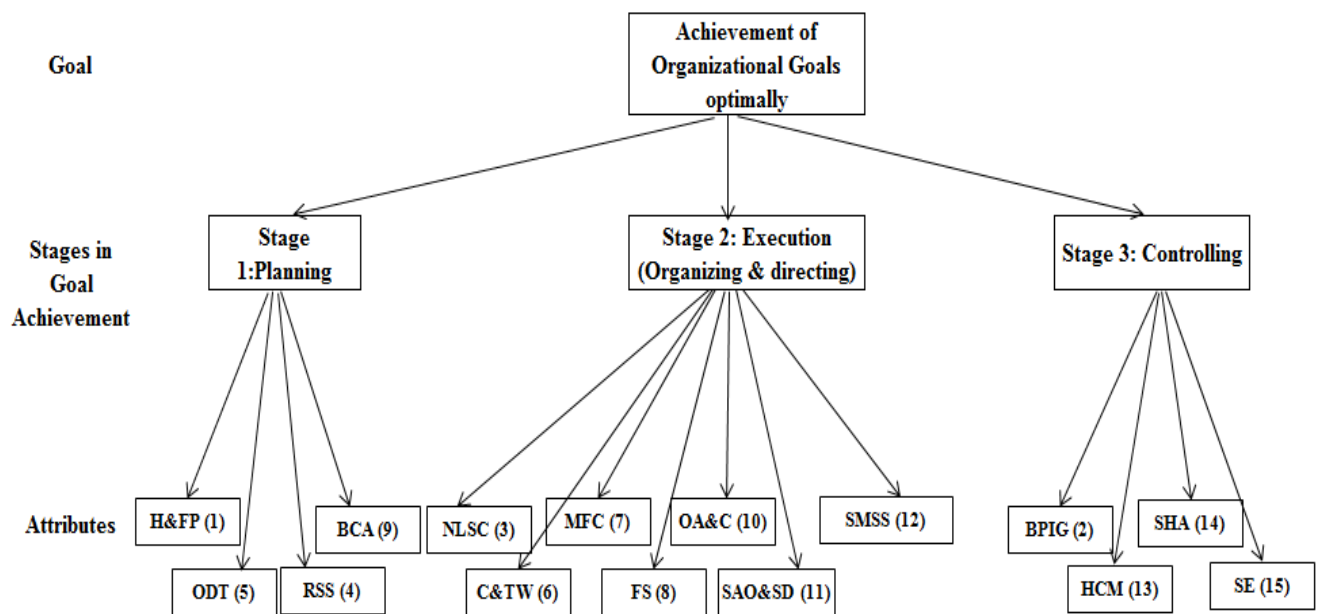


Figure 4.6: AHP Model

**Step I: Data collection and analysis:** After structuring the AHP hierarchy, a pair-wise comparison questionnaire has been developed (Appendix 1). The questionnaire consists of all the elements of the three levels of the AHP model and is designed to collect pair-wise comparison judgments from the experts. The experts are same who were involved for ISM methodology. The nine-point scale as suggested by Saaty [275-277] has been used to assign pair-wise comparisons of all elements in each level of the hierarchy. The pair-wise comparison judgments are made with respect to



attributes of one level of hierarchy given the attribute of the next higher level of hierarchy, starting from the level of achievement of organizational goals optimally down to the level of attributes. So, in all four pair-wise comparison matrixes were formulated. The results collected from the questionnaire are used to form the corresponding Pair-wise Comparison Judgment Matrices (PCJMs) (Appendix 2) for determining the normalized weights as explained in the next step.

**Step III: Determining normalized weights:** Although pair-wise comparisons is an effective way of deriving relative importance, but, their results may be somewhat subjective and inconsistent. To address this issue, an index called the consistency ratio (CR) is used to check the validity of relative measures. According to a rule of thumb suggested by Saaty [275], a CR value equal to 0.10 or less is considered acceptable. It can be seen that the consistency ratio of each of the PCJM is below 0.1. This clearly implies that the evaluators are consistent in assigning pair-wise comparison judgments [275]. The software system called ‘Super Decisions’ is used to determine the normalized priority weights. Table 4.14- 4.17 shows normalized priority weights of the four PCJMs.

Table 4.14: Relative weights of stages in goal achievement

Name	Normalized	Idealized
Stage 1 Plan	0.43	1
Stage 2 Execute	0.33	0.76
Stage 3 Control	0.25	0.58
Inconsistency	0.01759	

Table 4.15: Relative weights of human body attributes w.r.t. planning

Name	Normalized	Idealized
BCA (9)	0.21	0.34
H&FP (1)	0.60	1.00
ODT (5)	0.13	0.21
RSS (4)	0.06	0.10
Inconsistency	0.10	

Table 4.16: Relative weights of human body attributes w.r.t. organizing & directing

Name	Normalized	Idealized
C&TW (6)	0.18	0.64
FC (8)	0.24	0.86
MFC (7)	0.07	0.26
NLSC (3)	0.03	0.10
OA&C (10)	0.28	1.00
SAO&SD (11)	0.13	0.48
SMSS (12)	0.08	0.29
Inconsistency	0.08473	

Table 4.17: Relative weights of human body attributes w.r.t. controlling

Name	Normalized	Idealized
BPIG (2)	0.03	0.07
HCM (13)	0.29	0.57
SE (15)	0.16	0.31
SHA (14)	0.51	1.00
Inconsistency	0.09204	

**Step IV: Synthesis:** After computing the normalized priority weights for each PCJM of the AHP hierarchy, the next phase is to synthesize the results for finding the significance of each variable towards the macro goal. The normalized local priority weights of planning, organizing & directing, controlling and of all attributes are combined together with respect to all successive hierarchic levels to obtain global composite priority weights of all attributes used in the third level of the AHP model. The synthesized weights are shown in Table 4.18.

Table 4.18: Overall relative importance weights of stages and attributes

Attributes	Ideals	Normals	Raw
BCA (9)	0.34	0.09	0.04
BPIG (2)	0.03	0.01	0.00
C&TW (6)	0.22	0.06	0.03
FS (8)	0.30	0.08	0.04
H&FP (1)	1.00	0.26	0.13
HCM (13)	0.28	0.07	0.04
MFC (7)	0.09	0.02	0.01
NLSC (3)	0.04	0.01	0.00
OA&C (10)	0.35	0.09	0.04
ODT (5)	0.21	0.05	0.03
RSS (4)	0.10	0.03	0.01
SAO&SD (11)	0.17	0.04	0.02
SE (15)	0.15	0.04	0.02
SHA (14)	0.50	0.13	0.06
SMSS (12)	0.10	0.03	0.01

#### 4.5.2 Interpretations of AHP

After calculating the global weights of each attribute, it is observed that there are variations in the relative weights of the 15 key attributes, which indicates that each attribute is not equally critical in effective and efficient management in HBO. This validates the need of the applying AHP after ISM.

It can be inferred from the relative weights (Table 4.18) that holistic and flexible planning in an organization has the maximum weight- 0.26, indicating it to be the key attribute for goal attainment. Moreover, self healing ability of the subsystems which is analogous to self regulation by employees in organizational context is another important attribute after holism with a relative weight- 0.13. Other human body attributes which are found to be the key for effective and efficient management are- the presence of brain as central authority (0.09), optimally balanced autonomy and control (0.09), and functional specialization (0.08). Apart from these three, the remaining attributes are almost equally significant for goal attainment.

## 4.6 SAP-LAP Analysis

The perceived optimality of human body organization leads to inquisitiveness about the principles and processes behind it. Hence a need to develop an explanatory model of human body as an organization emerges. A SAP-LAP analysis of the above situation can probably help us in generating such model. However, due to limitations of length of study, this analysis is confined to only six situations. The situations are selected based on their uniqueness to current organizational philosophy. Following situations are taken into consideration for the analysis:

**Situation 1:** Holistic, yet flexible planning of growth.

**Situation 2:** Physical and mental growth takes place gradually and maintains a perfect balance between them.

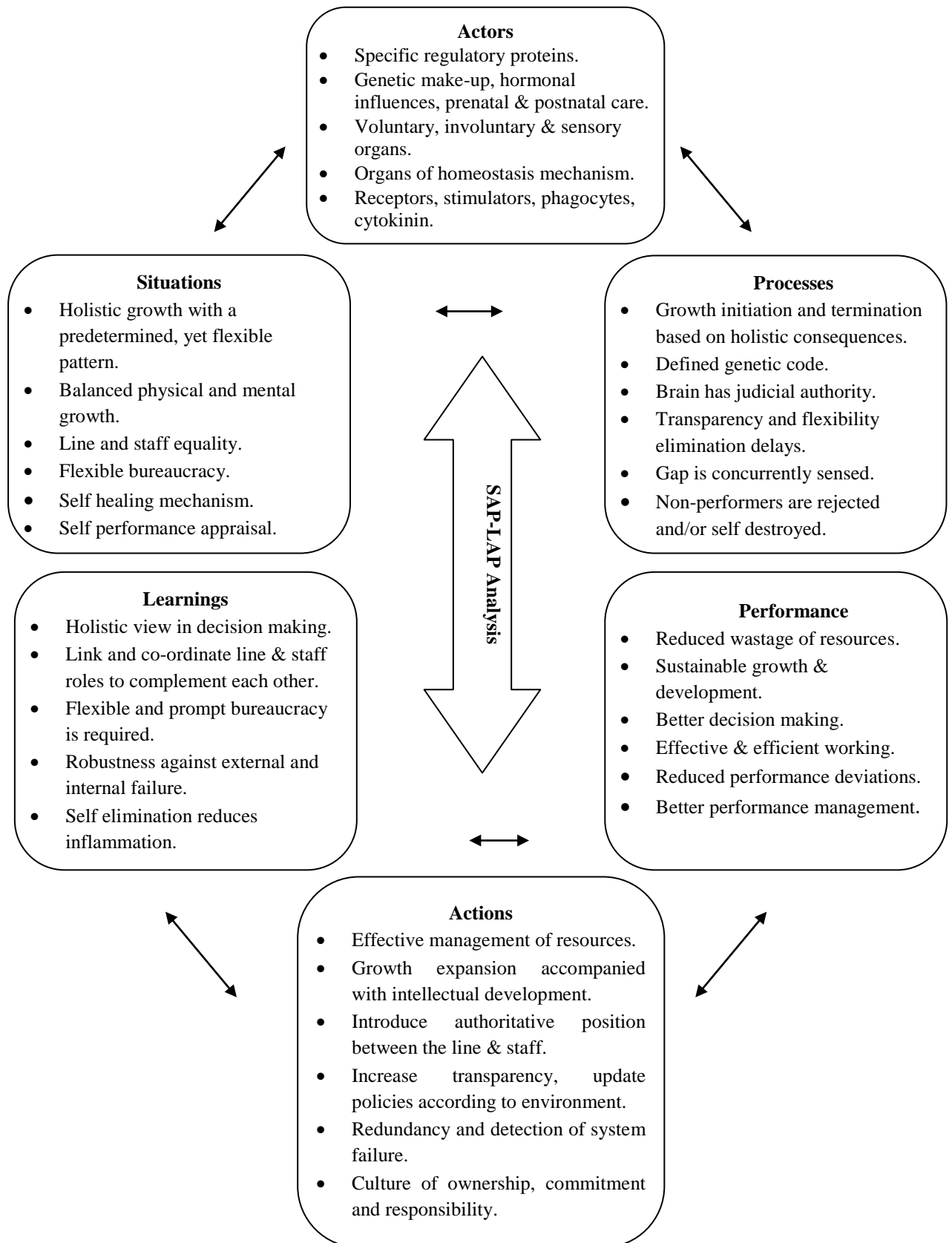
**Situation 3:** Line and staff members can be seen with no status discrepancies.

**Situation 4:** System driven, yet prompt and flexible.

**Situation 5:** A Self healing mechanism as a control measure.

**Situation 6:** Cell suicide mechanism to manage performance of individual employees (Feedback control)

A SAP-LAP analysis of above situations demonstrating perfection in human body organization is illustrated through Table 4.19 as well as Figure 4.7.



**Figure 4.7: SAP-LAP Framework**

Table 4.19: SAP-LAP analysis of human body organization

S. No.	Situations in Corporate Body vis-à-vis Human Body	SAP-LAP Analysis of Human body organization situations				
		Actors	Processes	Learning	Action	Performance
1	<p><b>Corporate Body:</b> Corporate organizations need some strategy to take appropriate decision, whether to replenish the resources to meet the original level or not.</p> <p><b>Human Body:</b> Human body analyses the affects of unplanned cell growth and multiplication to heal the damage caused by external forces before resuming it.</p>	<ul style="list-style-type: none"> <li>• proteins (coded by oncogene) that stimulate cell growth.</li> <li>• protein like p53 that analyze the situation to restrict cellular growth and division and even promote programmed cell death.</li> </ul>	<ul style="list-style-type: none"> <li>• On occurrence of an injury, p53 protein isolates the cells with un-repairable DNA before stimulation of cell division by oncogene protein to heal the damage.</li> <li>• P53 then signals to resume growth to fix damage of only repairable cells.</li> <li>• Also it signals un-repairable cells to undergo self elimination.</li> <li>• If the cells with un-repairable DNA are allowed to divide, it may cause cancer.</li> </ul>	<ul style="list-style-type: none"> <li>• Problems should be analyzed holistically.</li> <li>• Every situation does not need immediate and similar consideration like cells with un-repairable DNA are not subject to growth.</li> <li>• Immediate short-term solutions can aggravate the problem or even lead to other problem like cancer in case of human body.</li> </ul>	<ul style="list-style-type: none"> <li>• Follow holistic approach to analyze every situation.</li> <li>• Use flexible approach to decide actions on situation that needs genuine consideration and those that could be ignored.</li> <li>• For instance, initiate or close down resource hiring considering the overall consequences.</li> </ul>	<p>Applying such mechanism will lead to effective and efficient management of resources, growth and development of organizations as efforts would not be wasted in unproductive activities.</p>

Table 4.19: SAP-LAP analysis of human body organization

S. No.	Situations in Corporate Body vis-à-vis Human Body	SAP-LAP Analysis of Human body organization situations				
		Actors	Processes	Learning	Action	Performance
2	<p><b>Corporate Body:</b> Organizations are needed to balance its intellectual and physical growth to achieve long term sustainability.</p> <p><b>Human Body:</b> Growth and development occurs gradually and simultaneously in all areas to develop into a rational and healthy individual.</p>	<ul style="list-style-type: none"> <li>Internal Actors: Genetic make-up, hormonal influences, etc. [45].</li> <li>External Actors: Prenatal &amp; postnatal care, Education and Co-curricular activities, sports and other physical activities, Quality of diet, Climate conditions, etc.[156].</li> </ul>	<ul style="list-style-type: none"> <li>According to Ayres [19] human body develops from fertilization to maturity through a predetermined genetic code, a process termed as 'ontogenic development' [144].</li> <li>Physical and mental growth occurs in a proportionate manner during these stages.</li> <li>Relevant external and internal growth factors also affect growth and development in both human body and corporate organization.</li> </ul>	<ul style="list-style-type: none"> <li>The importance of optimal balance can be understood by visualizing a fully grown individual with a less developed mind or an exceptionally developed mind with a less developed body.</li> <li>Also the growth of an organization must take into account all relevant external and internal factors to face market challenges (like human body faces) for sustainable growth.</li> </ul>	<ul style="list-style-type: none"> <li>Future expansion or growth plans must evaluate all the internal and external factors rather than focusing on one aspect at a time and then should formulate balanced physical and intellectual capital growth plans.</li> <li>This can be done by planning stages of development and crises i.e. creativity, direction, delegation, collaboration and co-ordination.</li> </ul>	<p>With increase in size and enhanced expertise, the organization shall now be able to handle bigger tasks and challenges and the growth so achieved shall be sustainable.</p>

Table 4.19: SAP-LAP analysis of human body organization

S. No.	Situations in Corporate Body vis-à-vis Human Body	SAP-LAP Analysis of Human body organization situations				
		Actors	Processes	Learning	Action	Performance
3	<p><b>Corporate Body:</b> The concept of line and staff has led to conflicts where the line people are considered as prominent people (involved in execution) and staff members (involved in advisory roles) are considered secondary or less important.</p> <p><b>Human Body:</b> No status related conflicts between line and staff function and both of them operate complementing each other.</p>	<ul style="list-style-type: none"> <li>• Line function: Voluntary and Involuntary organs as described in the situation part.</li> <li>• Staff function: Five senses - taste, touch, smell, hearing and sight [186].</li> </ul>	<ul style="list-style-type: none"> <li>• Human body sensory organs (staff members) after receiving stimuli from the environment, it passes necessary input signals to the brain.</li> <li>• The brain gives directions to the organs of achievement (line members), which they are bound to follow as not in external touch..</li> <li>• This way the advisory capacity of staff members is fully utilized [186].</li> </ul>	<ul style="list-style-type: none"> <li>• Organizations need to develop mechanisms inspired by human body that can suitably link the line and staff function together and co-ordinate the work of two to complement each other.</li> <li>• Staff must have independence to give their best advice to help the enterprise succeed and line managers to execute them in their way within the strategic framework.</li> </ul>	<p>Introduce positions with judicial capacity between staff and line members to receive feedbacks and advices from staff members, evaluating &amp; filtering them and passing them on to line members and ensuring implementation</p>	<ul style="list-style-type: none"> <li>• Elimination of line and staff disagreement would definitely lead to better utilization of support and advisory capacity of staff organization.</li> <li>• Enhanced co-ordination between the two will lead to sound managerial decisions and the efficient and beneficial realization of the organization's objectives.</li> </ul>



Table 4.19: SAP-LAP analysis of human body organization

S. No.	Situations in Corporate Body vis-à-vis Human Body	SAP-LAP Analysis of Human body organization situations				
		Actors	Processes	Learning	Action	Performance
4	<p><b>Corporate Body:</b> Bureaucratic model has become obsolete as designed to deal with stable environments [35]. It also leads to delays in decision making and performance (because of hierarchy).</p> <p><b>Human Body:</b> Despite the downsides of bureaucracy, human body organization can be visualized as a perfect example Weber's bureaucratic model, system driven but optimal and efficient.</p>	<ul style="list-style-type: none"> <li>• Endocrine system</li> <li>• Autonomic (sympathetic and para-sympathetic ) nervous system</li> <li>• Regulatory centers</li> </ul>	<ul style="list-style-type: none"> <li>• Homeostatic mechanisms in body help in making adjustments to maintain equilibrium [285]. • e.g. when body temperature rises, nervous system detects and to counteract, it signals endocrine system to cause sweating. • Also central guiding and authoritative position lies with single body i.e. brain (sympathetic and parasympathetic/autonomic nervous system), which directs to give speedy reaction (reflexes).</li> <li>• For this purpose each unit in body is endowed with sufficient information in the form of DNA.</li> </ul>	<ul style="list-style-type: none"> <li>• Flexibility and promptness is necessary feature for every organizational model. • A bureaucratic structure with these features will ensure precision, speed, clarity, regularity, reliability, and efficiency achieved through creation of division of tasks based on specialization, hierarchical supervision and detailed rules and regulations.</li> </ul>	<ul style="list-style-type: none"> <li>• Developed a structure where rules should be dynamically revised and flexibility dimension should be built as a part of it. • A more balanced form of hierarchy should be adopted where there is maximum flexibility with the members to decide what to do, so that they are free to choose how to realize the shared mission. • Each level of hierarchy will be identified as only a layer to execute a specific function.</li> </ul>	<ul style="list-style-type: none"> <li>• Such structure will encourage focus on rules and standards, where operational processes are controlled with best-practices and close supervision; • and flexibility will allow accommodating dynamic needs. • Standardization and transparency will ensure that work is consistently performed efficiently and effectively.</li> </ul>

Table 4.19: SAP-LAP analysis of human body organization

S. No.	Situations in Corporate Body vis-à-vis Human Body	SAP-LAP Analysis of Human body organization situations				
		Actors	Processes	Learning	Action	Performance
5	<p><b>Corporate Body:</b> Business organization lacks any automatic control mechanisms and thus requires constant monitoring and control to reduce deviations from standards.</p> <p><b>Human Body:</b> Human body is equipped with a self healing mechanism to handle various kinds of malfunctions. It adjusts itself to a wide range of environment [129].</p>	<p>Cells, Tissues and Organs involved in homeostasis mechanisms.</p>	<ul style="list-style-type: none"> <li>• Human body is equipped with ‘self-healing’ ability to recover its initial properties after destructive actions of the external and internal stresses.</li> <li>• This process gives information about the gap between the stated and actual level of a system parameter, and translates it into action to correct the gap [382].</li> <li>• e.g. upon rupture of a blood vessel wall, activated platelets release chemicals to attract even more platelets to form a sticky clot at the damaged site [297].</li> </ul>	<ul style="list-style-type: none"> <li>• Robustness against external and internal failures is one of the important requirements to achieve self healing [34].</li> <li>• Self healing mechanism in human body can inspire organizations’ members to develop a practice of scanning the conditions within the group and take necessary actions on finding any dis-functionalities.</li> </ul>	<ul style="list-style-type: none"> <li>• Collaboration among the group members is the best way for laying foundations of the self correcting mechanism.</li> <li>• Redundancy in detection of system failure could be the strategy for it.</li> <li>• It can also be achieved by creating subordinate goals, joint problem solving, and by increasing interactions among them.</li> </ul>	<ul style="list-style-type: none"> <li>• Deviations from planned targets could be reduced.</li> <li>• Non performance at individual or group level can be corrected without any delay as soon as it is recognized.</li> </ul>

Table 4.19: SAP-LAP analysis of human body organization

S. No.	Situations in Corporate Body vis-à-vis Human Body	SAP-LAP Analysis of Human body organization situations				
		Actors	Processes	Learning	Action	Performance
6	<p><b>Corporate Body:</b> Managers are looking for ways to redesign the existing appraisal system or develop a new one to effectively handle the employees' performance related issues.</p> <p><b>Human Body:</b> A cell is basic resource for human body, which manages its proliferation according to its requirement to the body and eliminates itself if found unfit for the role [178].</p>	<ul style="list-style-type: none"> <li>• Specific receptors for detecting any sort of infection or distortion,</li> <li>• Stimulators that initiates the process of cell death,</li> <li>• Phagocyte cells that eat the dead cells,</li> <li>• Cytokinin that inhibit inflammation which would otherwise be a danger to the surrounding cells [308].</li> </ul>	<ul style="list-style-type: none"> <li>• The damaged, distorted or infected cells are analogous to non performing employees.</li> <li>• Such cells are not required by the body and there are two ways to eliminate them i.e. apoptosis and necrosis [16].</li> <li>• According to Kam, et al. [178] apoptosis is programmed and genetically regulated cell suicide mechanism, which can be self-induced or by rejection of others.</li> <li>• The second way, necrosis according to Dutchen et al. [110] is an unplanned response to some trauma or infection (like touching a hot object) that also affects the nearby cells by causing inflammation.</li> </ul>	<ul style="list-style-type: none"> <li>• Apoptosis and necrosis as the two processes of cell death can be visualized in organizational context also.</li> <li>• Apoptosis, the programmed dismissal can be achieved in the form of voluntary resignations with reduced harm to the employee.</li> <li>• Necrosis is the form of sudden terminations affecting the non performing employee and salary cuts or reduced increments for bad performing employees.</li> </ul>	<ul style="list-style-type: none"> <li>• To implement this, create a culture wherein each unit or employee of organization bears high level of responsibility, ownership and commitment towards organizational goals.</li> <li>• In case of non-performance, employee will be asked to resign voluntarily.</li> <li>• In extreme situations non performing employees are terminated and bad performing employees may face monetary losses (like necrosis).</li> </ul>	<ul style="list-style-type: none"> <li>• A non performing employee would be saved from embarrassment of being fired from the job.</li> <li>• It will not be viewed as a dismissal in future.</li> <li>• Sudden dismissal may exert negative effect on others.</li> <li>• A high performing organization can be created where each employee thinks and acts like owner thus striving for excellence and controlling their own performance.</li> </ul>

## 4.7 Conclusions

In this chapter similarities between human body and corporate body have been brought out based on classical managerial functions; namely planning, organizing, directing and controlling. The comparison between the two reveals some attributes of human body which possibly make it a perfect organization. The attributes include: holistic-rule based and flexible approach in human body; optimal degree of transparency, balance in physical and mental growth, and balance in autonomy and control. The comparison also reveals that human body as an organization is endowed with flawless communication, functional specialization, feedback control and self healing mechanism. It has brain and mind as the directing body to guide various sub-units. Moreover, the attributes identified from the comparison have been developed into a framework to understand the relationships among the attributes in driving towards effective and efficient goal achievement. In this effort major strategic, operational, and performance outcomes were derived. It is expected that the developed framework will inspire business organizations to learn about improvements in the design and functioning of organization as a system.

Furthermore, the SAP-LAP analysis of these attributes provides a glimpse of various situations, actors and processes; learning, actions and performance prudent in the human body organizations from a managerial perspective. It can be observed from the analysis that human body follows holistic view with strategically optimized flexibility. The flexibility may vary from zero to near hundred percent depending upon its functional importance to rest of the body. Also, collaboration among group members, joint problem solving, transformation to a high performing and more committed system are among other human body strategies revealed from the framework. This framework also locates key result areas so that organizations can give higher priority to them. It includes effective and efficient management of resources, readiness to face external challenges, reduced deviations and appropriate performance appraisal tool.

In this way the strategies to enhance organizational efficiency and effectiveness can be developed inspired by the human body. However, the implementation of these insights requires a lot of strategic involvement. Moreover, utility of this framework can be enhanced by testing it in various practical situations. It is expected that a richer analysis can generate

even more insights for effective problem solving, strategic planning and organizational analysis.