10. Intelligence

Aggregate or global capacity of an individual to think rationally, act purposefully & deal effectively with his/her environment (Wechsler)

Theories of Intelligence

1. Content Theories — arrives at intelligence through factor analysis or factor theories.
Spearman, Thurstone, Hierarchical Theory, Cattell, Gardner
2. Process Theories — cognitive 4.
PASS Model, Sternberg, Hierarchical, Gardner.

Spearman's Two factor Theory

Two factor of Intelligence
- ① G-factor → common to all task, innate, mental energy constant & not affected by education; does not depend on race/sex
- ② S-Factor → Task specific, influenced by training

One G-factor various S-factor.
G factor independent of S & various S-factor independent of each other.
He discovered that test of mental ability are highly similar & correlate to a great extent that can be accounted on the basis of their common overlap with 'G'. This he acknowledge the possibility of group factors such as verbal ability & spatial ability.
Additional G factor — Perseveration, Oscillation & Will.

Evidences — performance in one area relates to other, Idiot Savant (low G-factor & high S), various intelligence test are +vely correlated.

Garrett → independent exp. and support Thurstone
→ intelligent valid for children upto age 6 (compared to S with age)

Thurstone Weighted Group factor Theory

denied the existence of G & S factor
Intelligence consist of group factor
Primary Mental Ability
Perceptual — ability to identify things quickly & accurately
Verbal — ability to understand & utilize verbal ideas
Spatial — ability to deal with things in space
Memory — retain & retrieve previously learned info
Reasoning — put together past experience & arrive at a solution
Numerical — carry out fundamental arithmetic op
Verbal — Words quickly & accurately

Thurstone's PMA is reported in terms of percentage and a psychogram is constructed. He found low positive 'r' among various PMA ⇒ low order of general ability.

Cattell's Theory

→ alternate to S & G
→ both are general order factor

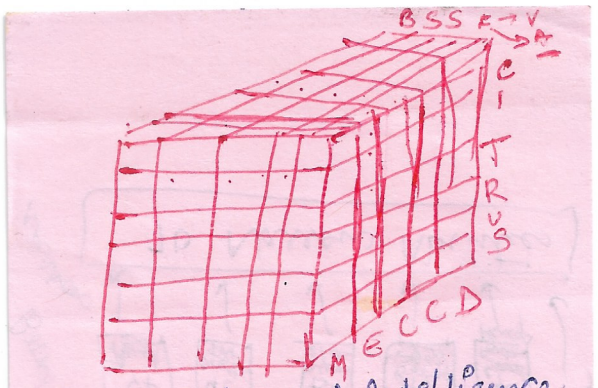
Two fundamental type of intelligence
Fluid Intelligence — genetic
It is ability to demonstrate general brightness, acquire new concept & show adaptability in novel situations.
Relatively independent of education.
Measurement: RPM. Non verbal & culture free
Crystallized Intelligence
It is governed by environment. It is combination of acquired knowledge & developed skill. It is investment of fluid intelligence in the higher order skills of culture to one is exposed. Measurement: SBIT
Fluid Intelligence increases till 14-15 & then declines till 25-30 & then stabilizes.

Guilford: Structure of intellect model

He proposed that any cognitive task could be understood by analysing the kind of mental operation to be performed, type of content or test material on which it is performed & the resulting product of performing a particular operation on a certain type of test content.
Cognitive Task → Content × Operation × Product
Initially 4 × 5 × 6 = 120
Later 5 × 5 × 6 = 150

Content (BSSF)
Behavioral — reflects social intelligence
Symbolic — mediated through no. & letters
Semantic — mediated through meaning
Figural — involves utilization of pictures & images. Later revised figural into Auditory & visual.

Operation (MECCD)
Memory —
Evaluation — judging wisely while behaving
Cognition — awareness of meaning of words & concept
Convergent Production — ability to conclude logical
Divergent Production — generate novel & unusual



Cubical Model of Intelligence
Each of the 120 cubes represent a PMA that is some combination of C, O, P.

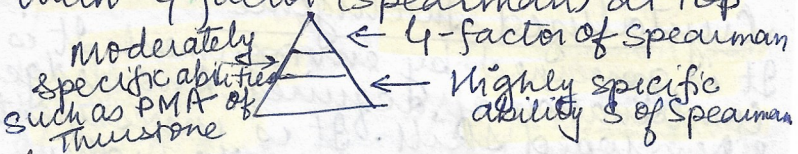
Product (CHARS)

Class – class of Units
Unit – single product such as word or number
System – refer to an action plan
Relation – relationship b/w units
Implication – anticipation
Transformation – involves a change

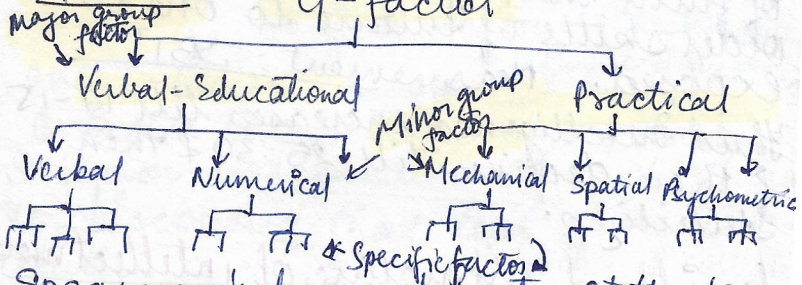
✓ Includes both Creativity & Social Intelligence. but is cumbersome with limited practical utility

Hierarchical Model

Intelligence in multilayered pyramid with G factor (Spearman) at top



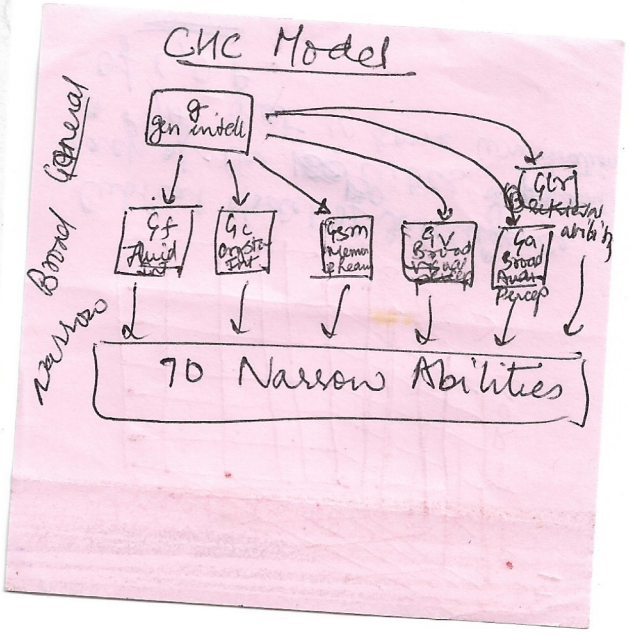
Vernon – G-factor



Spearman's general factor at the top
Relegating Thurstone's PMA & Guilford's Structure of intellect model to subordinate status under G

CHC Model (Cattell, Horn, Carroll)

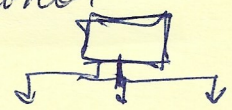
Fusion of GfGc Model of Cattell & Horn and three stratum model of Carroll.
It is a hierarchical framework of human cognitive ability that consist of 3 strata:
(i) General Intelligence or Stratum III
(ii) Broad cognitive ability – Stratum II
(iii) Narrow cognitive ability – Stratum I
Broad cognitive abilities like fluid, reasoning, auditory processing, processing speed etc.



Arthur Jensen

Intelligence operating at two level
Level I: Associative learning (rote learning & memory)
Level II: Cognitive competence involve higher order skills.

Example:
Analytical → Being able to run statistical analysis of data from an exp.
Creative → Being able to design the exp in first place
Practical → Being able to get funding for the exp from the donor



Triarchic Theory: Sternberg

first to go against psychometric approach & take a more cognitive approach.

He defined Intelligence as ability to adapt, to shape & select environment to accomplish one's goals & those of one's society & culture.

It consist of 3 sub theories

Componential Sub-Theory (Book Smart) (Compon. Intel or Analytical Int)

specifies the cognitive process that underline all intelligent behavior.

The mental component or the cognitive processes for operating on information and problem solving falls into five classes

i) Metacomponent - control monitor & evaluate cognitive processing

ii) Performance Component - executes strategies assembled by meta component.

iii) Acquisition Component - learning of new information occurs through it

(iv) Retention Component - carries out retrieval of stored information

v) Transfer Component - carries retrieved information from one situation to other.

(iii)(iv)(v) combined → Know. Acq. Component

Encoding & Comparing are two important process and who can do it quickly are more intelligent

* Unlike the structural approach of factor analytical model of intelligence the component process approach provide a more functional analysis of process involved in problem solving.

It places emphasis on diagnosis & remediation. In this model the attempt is to draw the diagnostic profile of strength & weakness in various component deployed by individual as he goes about PS.

eg: strategy deployed highlight Metacomponent. Transfer of knowledge - Transfer component.

Incorrect recall ⇒ Retention comp. deficiency

Experiential Sub-Theory (Creative Intelligence)

Experiential or creative intelligence is involved using past experience creatively to solve novel problems

The ways in which 3 components are [illegible] for everyday

Contextual Sub-Theory (Street Smart / Practical Intelligence)

It is concerned with the ability to adapt in the changing condition & to shape environment in such a way that one's strength's are maximized & weakness are compensated for.
It can also be called 'street smartness' or 'business sense'.

Later modification → concept of mental self government → represent an attempt to combine theory of intelli with (P) #

Theory of Cognitive Development - Piaget

✓ Also called Developmental stage Theory

Human intellect is constructed over time as the individual experiences progressively complex interaction with his environment (Constructivism)
Initial source of development - biological but rate and pace is influenced by environment.
Cognitive Development procedes through four stages and in these 4 stages mental operation of organisation & adaptation occurs.
Adaptation consist of Assimilation & Accomodation. (Cognitive Equilibrium)
The twin operation of Assimilation & Accomodation helps children fill the cognitive gap and restructure the belief when they fail to test out against external reality.

1. Sensorimotor (0-2 Years) → beginning of PS but limited to here & now
✓ learn there is relation b/w external world & their action.
✓ they discover that they can ~~prod~~ manipulate object & produce effect ⇒ Cause & Effect
✓ Object permanence is achieved
reflex action → intentional movement

2. Pre ~~operational~~ (2-7 Years)
✓ Language acquisition & concept develop
✓ Thinking is transductive (case to case)
✓ Thinking is perceptual ⇒ based on appearances & not on implication
✓ Egocentric thinking (inability to conserve)
✓ Animistic thinking - belief that inanimate objects have the properties & the characteristics of living object.
✓ Representational thought → ability to think about & symbolic to represent event (Symbolic Thinking)

✓ Primitive Identity concept
understanding that ~~the~~ certain characteristic such as length of object does not change because the object has moved to new location.

3. Concrete Operational (7-11 years)
✓ Egocentric thinking is replaced by relational thinking
✓ Conservation Principle is mastered
✓ children can think logically & systematically but only wrt tangible object.

4. Formal Operational (11-18 years)
Child reaches its maximum cognitive growth and is able to carry out inductive & deductive reasoning, hypothetical & abstract thinking & all form of complex thinking
✓ Become philosophical, ethical, moral, political, social.

Positives of Piaget's Theory
- created huge heuristic impact
- universal acceptance of his 4 stage
- popularized method of naturalistic observation

Limitation of Piaget:
(i) Underestimated cognitive ability of children wrt object permanence (4-5 months) & conservation principle (3 years) respect
(ii) Social Element absent - Criticized by Vygotsky
Piaget considered egocentric speech as a sign of immaturity whereas Vygotsky considered it important for child's cognitive development. He also emphasised the importance of guidance of caregiver & social interac
(iii) Time period assigned to each stage were not accepted universally
(iv) Use of naturalistic observation ⇒ the ~~implied~~ cause effect relations he arrived at remains speculative
(v) Piaget a stage theorist → cognitive development discrete & discontinuous but this is challenged by many Psist

Vygotsky - Inst. Speech

*The sequence of 4 period is completed by the age of 18 and what increases thereafter is not intelligence but achievement.

★ 5 process of Cognitive Develop

- Schema.
- Adaptation - Assimilation & Accomodation.
- Organization
- Equilibration - Equilibrium & Disequilibrium

The PASS Model

Model of intelligence

Das, Naglieri, Kirby

It is based on contemporary research both in cognition & neurophysiology & provides a theory of both assessment & intervention.

4 basic rules proposed by Das:

(i) Intelligence is not IQ but a cognitive process

ii) Intelligence changes due to learning & cultural dimension demands

(iii) Modules exist in mind for explicit purpose of characterizing & otherwise dealing with information processing of certain kind such as language or face recog.

(iv) Some aspect of intelligence are domain general & some domain specific.

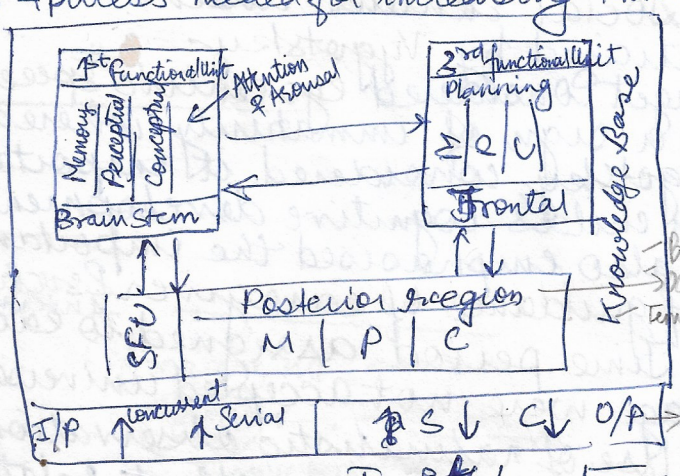
He worked on blueprint given by Luria who described human cognition into 3 functional units:

1st functional unit: ~~frontal lobe~~ brain stem - associated with arousal or attention & discrimination among stimuli. It provides a general state of readiness & focus for attention.

2nd functional unit: posterior region of the cortex - is concerned ~~with programming regulation & verification of cognitive activity~~ with reception, elaboration & storage of information by means of simultaneous & successive processing.

3rd functional unit - frontal lobe - is responsible for programming, regulation & verifying mental activity.

All 4 process needed for increasing knowledge



Knowledge - 2 Type - Tacit (Spontaneous & experiental) & Formal & Instructed Explicit.

Cognitive Assessment Scale (CAS)

it consist of verbal as well as non verbal tasks that measures basic cognitive function presumed to be independent of schooling. It can be used to diagnose learning strength & disability, attention deficit, mental retardation & giftedness. Battery of test meant for individual b/w 5 & 18 years of age.

PASS Reading Enhancement Program (PREP)

remedial program for primary school children with difficulty in reading, spelling & comprehension.

Aims to improve information processing strategy of individual while avoiding direct teaching of word reading skills. Founded on the premise that children find it easier to learn this strategy in inductive rather than deductive methods.

Multiple Intelligence (Frames of Mind) - Gardner

Described human intelligence as a set of skills that enables a person to solve genuine problems encountered in life.

His work is based on 4 principles:

- Intelligence is not singular entity
- each person unique blend of dynamic intelligences & vary within & among individuals
- Use of one intelligence can enhance another
- developmental theory apply to these multiple intelligences

Types of Multiple Intelligence (MINE BILLS)

1. Logical Mathematical Intelligence - capacity for intellectual abstraction, reasoning & PS. Order & sequence important, desire to know causality. eg - Engineers
2. Linguistic Intelligence - Use of language with clarity. eg poets writers
3. Interpersonal Intelligence - sensitivity to subtle aspect of others. Relegious leader, politician
4. Intrapersonal Intelligence - ability to form accurate model of oneself and to use this model effectively in life. politician, therapist, phil
5. Musical Intelligence
6. Spatial Intelligence - (skills in forming visual images & patterns). refers to the ability involved in using, forming & transforming mental images. Architect, painter
7. Naturalistic Intelligence - (sensitive to features of natural world) - It involves complete awareness of our relationship with natural world. Understanding pattern found in nature
8. Bodily - Kinaesthetic - ability to control one's body motion & ability to handle objects skillfully

Empirical Evidences — Ravi Jain (AIR - 9, CSE 2019) http://tiny.cc/rj09

i) Brain damaged patients – He studied these patients & found damage usually interferes with one intellect capacity but leaves other intact.
ii) Isolated Talents – eg: Idiot Savant & William Syndromme (exceptional talent in music).

Measurement of Multiple Intelligence

MIDAS – Multiple Intelligence Development Assessment Scale. by Shearer.
questionaire based on theory of MI. It covers 8 areas suggested by Gardner. MIDAS is popular with teachers, parents, councilors because it provides information that is not available from conventional intelligence test. It is used in conjunction with Interest inventories & value test.

Limitation of Gardner

i) Gardner considered MI to be autonomous but evidence show they are +vely ('r').
ii) He excluded certain intelligences from his theory which he should have included because they happen to be part of culture. eg: Moral, spiritual, culinary intelligence.
iii) He divided human intelligence in arbitrary ~~method~~ manner. eg: Mechanical Intelligence part of BKI ⇒ Mechanics a good dancer.

Intelligence Quotient:

Simon & Binet → concept of Mental Age
If MA < Chronological Age (CA) ⇒ Retardation
Stern → $IQ = \frac{MA}{CA} \times 100$

IQ scores reflect someones level of performance on a standardized task. These tasks are designed to be indicative of general quality called intelligence.
IQ scores obtained should not be considered as absolute measures.
Younger the child is less reliable the score is.
IQ is not closely related to other desirable qualities such as career achiement & happiness.
huge debate whether general intelligence exist or we can better understand human potential in the form of various different sub-type of intelligence.
~~probability~~ possibility of unreliability of Ptal testing

Limitation of IQ Scores

(i) Mental ability does not increase throughout the life but ~~the~~ CA does ⇒ ↓ in IQ.
(ii) It was believed that IQ scores strictly follow the bell curve. However this not the case. there is ~~are~~ ~~two~~ much high incidence of very high & very low IQ score.
(iii) Variability in IQ score from one test to another is not the same
(iv) Difficult to convert IQ score to other achievement or ability test.
(v) IQ scores obtained from one age level cannot be easily compared with scores from another

Deviation IQ (by Wechsler)

In the light of above problem MA is no longer used for calculation of IQ score. Instead Deviation IQ is used which is based on deviation from average score (IQ=100) in a normal distribution compared to his/her age peers. Deviation IQ is an index of intelligence derived from comparing the individual's score on an intelligence test with the mean score for that individual's reference group

IQ Constancy:

studies indicate that IQ is relatively constant within restricted limits for average child under ordinary circumstances. ← test - retest reliability

Constancy of IQ → heriditary, → environment, → educational & instructional experience

large shift only because of drastic change in environment.

Measurement of Intelligence

Galton, first scientist to undertake systematic & statistical investment of individual differences. He tried to measure intelligence by means of imagery & sensory discrimination
Simon & Binet → Mental Age
Terman → SBIT ← IQ

Problems of Intelligence Testing:

(i) Cultural Bias → Language & culture of the test construction
(ii) Incompleteness
(iii) Cut off (iv) Absolute Zero
(v) Not to be achievement test

Misuse —

- poor performance on a test → Stigma
- test may invite discriminatory practices from parents
- Intelligence test do not capture creative potentialities and practical side of intelligence

Test : SBIT, WAIS, WISC

Aptitude :

It is a condition or a set of characteristics regarded as symptomatic of an individual's ability to acquire with training some knowledge, skill or set of responses.

It can be innate or acquired, are indicative of future potentialities.

Achievement refers to what a person has acquired or achieved after training or specific instruction has been imparted.

Aptitude Testing

Assumption : individual potentialities are not equally strong, individual differ one from another in their potentialities

Types of Aptitude Test

i) Multiple Aptitude Test – battery of test intend to measure several aptitude each by an independent subtest

ii) Specific Aptitude Test – intend to measure only one aptitude. Before MAT. After research of Thurstone & Guilford emphasis has been shifted from SAT to MAT.

Uses of Aptitude Test :

personnel selection & Testing; for vocational, Educational & Material counselling; Clinical ~~personnel~~ purpose, selection of trained personnel.

Limitation / Challenges to Aptitude Test

i) weights assigned to different factors

ii) Many Aptitude Test do not have high validity.

iii) problem of Definition

Emotional Intelligence —

Payne coined the word.

It is reason with emotion & use of emotion in reason.

Mayer & Salovey defined ~~emotion~~ it as ability to monitor one's own & other's feeling & emotion, to discriminate among them & to use this information to guide thought & action.

① Self awareness

Attributes of EI people

- ✓ knowledge of one's emotion
- ✓ set realistic goal & achieve +ve goal discrepancy
- ✓ they are street smart
- ✓ high stress tolerance because of objective & realistic appraisal mechanism
- ✓ superior emotional perception & identification
- ✓ capacity to guide their emotion to promote thinking
- ✓ they are better able to comprehend relation b/w thoughts, emotion & behavior
- ✓ take responsibility for their emotion & turn negative emotions into positive learning & growth experience

Goleman —

Self awareness (realistic goal setting) —+ve goal discrepancy→ Self motivation ③ ↕ Self regulation (monitor their emotion clearly) (prevent from becoming prisoner of own feel)

ability to take perspective of others ⇄ ④ Empathy ↕ Social Skills → handling relationship ③

Relationship b/w EI & EQ

Steve Hein

EI	Socialization	EQ
Potentials & innate, moderate 'r' with IQ	1) Early Life exp. 2) attachment with mother, father, caretaker, school ⇓ ↑ regardingness ↓ demandingness ↑ warmth ↓ indulgeness ↑ empathy ↑ security	the extent to which EI has been realized. Measure EQ through measure of behavior. ↑EQ ⇒ ↑EI ↑EI ⇏ ↑EQ

Development of Emotional Intelligence

1) Role Playing → improves interpersonal competency → self knowledge
2) Sensitivity Training
3) communication training
4) Esteem building exercise - use of +ve reinf
5) Training in use of social memory → use of Mnemonics
6) Relaxation Training Method
Mediation, Progressive Relaxation, Biofeedback.
7) Use of ~~imago~~ imagery
8) Awareness Building Therapy
- Gestalt awareness training, Rational Emotive Therapy.
9) Arousal Management Technique
- RET & Self Instruction Training.
10) Achievement Motivation Training

Measurement of EI

① Ability Test → Mayor Salovey Caruso EIT (MSCEIT)
→ Multifactor EIT (MEIT) ✓ Cheering up when low
② Self Report
③ Projection Test
④ Situational Test.

People with low on EI

✓ can't make intelligence choice.
✓ low in expression
✓ have poor interpersonal relationship.
✓ impulsive, depressed, anxious
✓ less motivated

Goleman

Knowing our emotion
Managing Emotion ← eg - ~~understanding~~ anger mgmt
Motivating ourselves
→ Understanding other's emotion
→ Handling Relationship

✓ Delayed gratification

Self Motivation
✓ to use this knowledge in achieving goal (personal & social)

Empathy -
✓ understanding other's emotion & feeling.
✓ better able to comprehend message

Social Skill
✓ Handling ~~emotion~~ relationship.

Evolution of EI

✓ Thordike - Social Intelligence
✓ Gardner - Frames of Mind → Interpersonal & Intrapersonal
✓ Payne - coined EI.

Goleman -

Self awareness → Know strength & weakness
✓ Knowing one's emotion.
✓ Superior in emotion perception.
✓ ~~Self control~~
✓ realistic goal setting
✓ Stret smart.

Self regulation → turn negative emotion into positive learning & growth experience.
✓ managing one's emotion
✓ self ~~regat~~ control
✓ Objective & realistic appraisal
✓ high stress tolerance