



Possible Metrics and Relative Methods to Measure Human Intelligence

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ABSTRACT:

The study of human intelligence is possibly the most controversial area in psychology and also identically psychometric assessment of intelligence is a blooming and a dominant aspect of applied psychology. This report consolidates the following issues related to human intelligence:

- The requisites to measure human intelligence.
- Definition for „Human intelligence.
- Extensivity of „Human Intelligence.
- Possible metrics and Relative methods to measure human intelligence.
- Discourse on scale type, meaningfulness, weakness in conjunction with strengths for the possible metrics and finally the reflections.

KEYWORDS:

HUMINT- Human Intelligence
NATO-North Atlantic Treaty Organization
SBIS- Stanford-Binet Intelligence Scale
WISC- David Wechsler Intelligence Scale
CTONI- Comprehensive Test of Non Verbal Intelligence
IQ-Intelligence Quotient

1. INTRODUCTION:

The word „intelligence was actually originated from the Latin verb intelligere [1], which means understanding which is capable of adjusting to the environment. There exist different species of creatures in the universe; and it is a well-known fact that the „social animal is the axial part of the existing universe.

Animals merely feed to survive and reproduce, whereas humans on the other hand are known for their curiosity to understand and are more influential in changing their environment. Human Intelligence can be calibrated by the use of intuitive measures, since intelligence varies from one person to the other which is more dependent on the environment [2]. The major criteria which separate us from the animals are [3]:

- The potential to reason, converse and make deductive decisions in an environment of imprecision, uncertainty, scarcity of information and partiality of truth and possibility.
- The potential to perform a wide range of physical and mental activities without any measurements and complex computations.

According to the general intelligence theory proposed by Francis Galton intelligence means a genuine, anatomical-based mental faculty that can be analyzed by quantifying a persons reactive times to emotional situations.

2. HUMAN INTELLIGENCE:

There is no exact definition for the term „intelligence [4], rightly so it makes sense that trying to define the true meaning of the word intelligence is too ambiguous.

2.1 Defining Human Intelligence:

According to Cambridge online dictionary „intelligence is defined as “the ability to learn, understand and make judgments or have opinions that are based on reason” [5]. According to psychologists perspective of intelligence is “intelligence is considered as a mental trait, is the capacity to make impulses focal at their early, unfinished stage of information.



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Intelligence is therefore the capacity for abstraction which is an inhibitory process” [6]. According to researchers, the perspective of intelligence is “intelligence is the power to rapidly find an adequate solution in what appears priori to be an immense search space” [7].

3. MEASURING HUMAN INTELLIGENCE:

„HUMINT which is the syllabic abbreviation for human intelligence, means intelligence gathering by means of interpersonal contact. „NATO defines „HUMINT as “a category of intelligence derived from information collected and provided by human sources” [8]. In the present world, human intelligence plays a major role as it is a more generalized concept and has wide range perspectives. The invention of autonomous systems simplified the way humans lived [9], but trying to understand and validate the level of intelligence embedded in these systems is more complex and much more complicated to understand. According to Galileo Galilei, “what is not measurable make measurable” [10], but measuring intelligence is not same as measuring a physical entity. Intelligence is indeterminate, invisible and a physical phenomenon which makes it more complex and difficult to understand and measure. There different models that are proposed to measure human intelligence. Intelligence quotient is one of the extensively used measurement techniques since it gives some kind of quantitative value.

4. HUMAN INTELLIGENCE TEST MODELS:

Human intelligence models are created by considering various hominid factors such as environment, experience and age. According to [11] different standardized tests are recommended to measure intelligence for different age groups. Some of the important models are discussed below:

- Binet and Simon scale.
- Stanford-Binet intelligence scale (SBIS).
- David Wechsler intelligence scale (WISC).
- Comprehensive test of non verbal intelligence (CTONI).

4.1 Binet and Simon Scale:

Binet and Simon invented this scale to measure the intelligence of children between 2 to 23 years. This scale was designed based on [12] which is used to measure the person’s ability and to identify the problems faced by them in grasping knowledge at schools. This scale consists of a set of questions which focuses more general knowledge and reasoning ability. For instance, assume that a person who is x years old solves a question that was mainly intended for a person $x+y$, then comparatively both have the same mental age, where x is the age of the person and y is a finite number which is greater than one.

4.2 Stanford Binet Intelligence Scale:

This scale is major revision of Binet and Simon scale proposed by Lewis Terman. This scale assesses the intelligence and emotional competence in children starting from two years and in adults. The Stanford-Binet scale tests intelligence across six areas: general intelligence, knowledge, fluid reasoning, quantitative reasoning, visual-spatial processing, and working memory [13]. This scale consists of a new measure called Intelligence Quotient given by the formula [13]:

$$IQ = (\text{Mental age} / \text{Chronological age}) * 10$$

4.3 David Wechsler Scale:

Consistent with Wechsler’s theoretical notions, construct and predictive validity of the Wechsler scales are greatest at the more global IQ level. The different types of human intelligence measuring scales are:

- Wechsler Intelligence Scale for Children (WISC), age group between 2 to 16 yrs.
- Wechsler Intelligence Scale (WAIS), age group 2 to 90 yrs.

IQ is the measure of Normal Curve with standard deviation.

4.4 Comprehensive Test Of Non Verbal Intelligence:

This test is intended to assess learning skills, reasoning skills for physically challenged students.



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5. INTELLIGENCE SUB-ATTRIBUTES:

The Oxford dictionary justifies the term attribute as “a quality or feature regarded as a characteristic or inherent part of someone or something” [14]. The attributes of a car can be color, shape, etc, which can be easily measured but contemporarily it is not that easy in case of intelligence. Measurement is an operation performed to establish relationship from empirical world to real world. In the present world IQ tests are broadly used to measure intelligence. According to Nikola Kasabov, mentioned the following properties of human intelligence in his „Evolving intelligence in humans and machines” [15]: adaptive learning, associative memory, pattern recognition, language communication, concept formation, abstract thinking, common sense knowledge, consciousness.

6. SCALE TYPES, WEAKNESS AND STRENGTHS OF MEASURES:

The tests that are proposed to measure human intelligence give quantifiable results to some extent but have pros and cons which are discussed further in the document. It is difficult to measure human intelligence quantitatively as decision making is a complex phenomenon [15]. The constraints in measuring the intelligence of a person is that it can be broadly affected by social and environmental factors which are not simple to understand. Referring to Gencel Cigdem, lecture 2 [10] there are various types of basic measurement scales: Nominal, Ordinal, Interval, Ratio and Absolute, depending on their strength in increasing order. Intelligence quotient (IQ) tests are the most researched approach to intelligence and most extensively used in practical setting.

But the weakness of this test is that it concentrates only on attenuated aspects of human intelligence but not the broader perspective. These tests are based on psychometric approach hence an ordinal scale is involved. The Binet and Simon scale, Stanford-Binet intelligence scales are used to measure the intelligence of children [12]. The weakness associated with this measure is that the decision of concluding the status of mental ability of the child belonging to a particular age depends on the score gained on solving the question which might not be true at all times hence these measures are classified into Ratio scale.

Stanford-Binet intelligence is advantageous because it focuses on broader aspects like reasoning, verbal and non-verbal skill. Comprehensive test of non-verbal intelligence focuses more on non-verbal reasoning skills of physically challenged persons.

7. REFLECTIONS:

We as students observed that there is no definite definition for the term intelligence. We came across intelligence measure tests such as GRE, TOEFL which are being used in the present education system to judge the aptitude and commutation level. We also understand that tests do not measure intelligence accurately but to some extent provide us plausible results. In the present world software organizations follow a traditional approach for recruiting people which involves a screening test which filters people based on their aptitude and mental ability. The score obtained determines the ability of the person, this approach to some extent is quantitative but not fruitful at all times.

8. CONCLUSION:

This report describes the importance of measurement in various aspects of life. The non-deterministic nature of intelligence makes it difficult to measure it. As the concept of intelligence is more complex and complicated we need to use experimental comparative values. These scales measure intelligence quantitatively but only to some extent. It also explains the various intelligence scale types, strengths and weakness. Finally we came to an understanding that intelligence is a concept which keeps on changing dynamically.

9. ACKNOWLEDGEMENT:

On reaching the verge of completion of our paper we came up with some fascinating facts like importance of metrics in other fields such as psychology, different intelligent scales, strengths and weaknesses.

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