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Valuation of Human Capital: A Review of Studies on Quali-Quantitative Methods

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Abstract

Human capital is an important component of company assets as an intangible element linked to the future potential of the company itself and, therefore, capable of contributing to a considerable extent to the creation of its value. It is clear, therefore, that the evaluation of the economic capital of a company cannot disregard the estimate of its human capital, or rather the enhancement of the knowledge, skills and intrinsic attitudes of the personnel and the methods of organization and management of the same, from the specialized technicians for ward assistants and management. The paper aims to present an overview of the techniques and models through which the business-economic literature and professional practice has addressed the problem of measuring human capital. The originality of this work is to follow a path that provides a framework as exhaustive as possible of methods, models and sources to refer to in the qualitative-quantitative measurement of human capital. This objective seeks to respond mainly, even if not exclusively, to the needs of those who work in the process of estimating the economic value of capital. From the comparison of the latter it is clear that there is no optimal choice for estimating the economic value of capital, but it is a prevalent opinion in the literature that qualitative and quantitative models, rather than antinomies, must be complementary.

Keywords: human capital, valuation model, qualitative and quantitative methods

1. Introduction

Human capital is one of the key assets of a company. Despite its intangible nature, it contributes to a considerable extent to the creation of value and to corporate development.

The valuation of the economic capital of a company cannot leave the estimate of its human capital out of consideration: from qualified technicians to managers, human capital is made of knowledge and skills, intrinsic aptitudes of employees, and the ways to organise and manage the workforce.

The estimation of human capital can serve as a business information tool and provide the basis for the management of wages, promotions, and transfers, while at the same time being used for the development of the human factor, the drawing up of financial statements or the estimation of economic capital.

The latter can be performed either with a qualitative valuation that tries to identify the variables and the relationships that may increase or decrease this value, or with a quantitative valuation aiming at identifying the value of human resources for the company at a given moment by means of a monetary metric.

Therefore, the two models are complementary, since each model belongs to a different logical category - 'quality' and 'quantity' - and aims to reach slightly different goals.

The paper aims to present a review of the techniques and models through which the business administration literature and professional practice have addressed the problem of human capital measurement.

For the purposes of including the assessment methods and models among those to which reference is made for the qualitative-quantitative measurement of human capital, a review of the main studies on the topic was carried out, then selecting those that found greater diffusion both in the corporate economic doctrine and in the in national and international professional practice.

The originality of this work lies in providing an exhaustive framework of methods, models and sources to be used as references in the quali-quantitative measurement of human capital. Our work is intended to address

mainly (even if not exclusively) the needs of those who work in the process of estimating the economic value of human capital. Moreover, beside the potential of each measurement method, its limits and points of strength are analysed in detail.

In light of the considerations above, the goal is twofold:

- To provide a general framework on the strictly theoretical aspects of the valuation of human capital (definition of human capital, role of human capital in economic valuation);
- To identify and describe various qualitative and quantitative methodologies for human capital estimation (qualitative and quantitative valuation of human capital).

The work is structured as follows: Sections 2 present an overview of the literature on the concept of human capital and the estimation of its economic value. Section 3, starting from a well-defined concept of human capital, identifies the different purposes for which the estimation of the human factor is deemed as necessary; the following sub sections are dedicated to the analysis of the main valuation methods used in international literature. The study concludes with a discussion of the main findings.

2. Literature Review

The broad definition of 'Human capital' is 'the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being'. (OECD, 2001, p. 18). The term encompasses some elements of the individual sphere that cannot be directly owned by the company, such as professional experiences and qualifications, the sense of belonging and loyalty to the organisation, the sharing of common values, and the ability to embrace cultural diversity.

The concepts of human capital and intellectual capital often tend to be assimilated: as a matter of fact, this interpretation is problematic, since human capital comprises the knowledge and skills of the people who work in a company (and create value); however, once transformed in organisational and relational «structures», knowledge and skills will constitute intellectual capital. The latter consists of at least three major value-generating areas, namely relational, structural and human capital. Among these areas, human capital, as it will be explained below, can be valuated separately with dedicated methodologies.

In the business administration literature, we can identify two major strands in the valuation of human capital. The first follows a qualitative approach and aims to measure not only the results achieved by an individual by his/her work, but also his/her skills and knowledge. The second strand follows a quantitative approach aimed at translating the value of human resources into monetary terms.

Table 1 shows the most influential studies conducted on the valuation of human capital for each of the aforementioned approaches, especially in terms of methodologies that can be applied to measure its value. Later on, many of the mentioned methods will be analysed and compared.

Table 1. Valuation of corporate human capital (Theoretical framework)

Estimation models		Author / Work
QUALITATIVE MODELS		Argyris, 1972; Porter & Lawler, 1968; Blake & Mouton, 1969; Tannenbaum, 1977; Koontz, 1971; Likert, 1973; Likert & Bowers, 1969; Flamholtz, 1989; McGregor, 1960; Zanda et al., 1993; Celli, 2012.
QUANTITATIVE MODELS	*Microeconomic theory*	De Angelo, 1982; Doeringer & Piore, 1971; Gitelman, 1968; OI, 1962; Pencavel, 1972; Piore,1968; Salop, 1973; Stoikov, 1969.
	Human Resource Accounting	Fontana, 1986; Gennaro, 1971; Manzonetto, 1972; Scifo, 1974; Viganò, 1976; Sacmann et al., 1989; Scarpello & Theeke, 1989; Zambon & Marzo, 2007; Rupo, 2003.
	Economic valuation	Lev & Schwartz, 1971; Brummet, 1968; Gennaro, 1971; Morse, 1973; Friedman & Lev, 1974; Jaggi & Lau, 1974; Sadan & Auerbach, 1974; Flamholtz, 1971; Ogan, 1976; Myers & Flowers, 1974; Hermanson, 1964; Zanda et al., 1993; Sangeladji, 1977; Hekimian & Jones, 1967; Zanda et al. 2013; Rupo, 2003.

3. Valuation of Human Capital

The valuation of human capital does not refer to the value of individuals as such, but to the monetary value assignable to the economic performance of human resources operating within a company. It is inherently linked to the quality of the organisation of the workforce. In fact, only the employees can be considered assets and can be subjected to valuation accordingly.

In the business administration literature, as mentioned above, two different approaches - qualitative and

quantitative - can be identified for the estimation of human capital, as well as two different estimation methodologies.

According to the first approach, the value of human capital should not be quantified in direct monetary terms, but in relational ones; therefore, the value attributable to the human factor depends on some variables and on the relations between them. In other words, the methods based on this approach neglect the quantitative aspect, focusing instead on the qualitative analysis of the variables that, through the definition of their values, have an impact on the level of organisation of human resources.

In contrast, the quantitative approach aims to approximate the monetary value of a given human resource, regardless of other tangible and intangible elements that constitute the company to which the resource belongs.

Although the methods based on the quantitative approach are preferred for the estimation of human capital in a corporate environment, qualitative methods are still regarded as useful. Quality turns out to be meaningful in the valuation of human capital, as it allows for elaborating a sort of a judgement of suitability, i.e. to ascertain if the workforce is well-structured in terms of competence and personal motivation. Furthermore, the qualitative analysis allows for auditing the quality of management, a key factor for the determination of the specific value of corporate human capital.

Taking all the above into consideration, qualitative and quantitative methods should be considered complementary in the estimation of the human capital of a company. For this reason, hereinafter we will examine the most relevant quali-quantitative valuation methods developed in the literature for the estimation of economic capital.

3.1 Qualitative Valuation

Qualitative valuation is a process based on the systematic retrieval of information about performance, attitude, management skills and technical expertise of each individual within the organisation.

The first models for a qualitative valuation of human resources proposed in the literature are based on the postulates of "Theory X" by McGregor (1975) and on a management style mostly based on authority and control. According to these models, the valuation of the workforce should take into consideration the characteristics and attributes of the personality of the subject to be valuated (‘trait theory’ and ‘contingency theory’) or the behaviour of the subject at work and in the organisation. In this way, however, the retrieval of unbiased quantitative information on the efficiency and the aptitude of an individual to achieve the expected results is often neglected. The appreciation of merits is based on elements of a mostly qualitative nature and, in general, is not linked to the actual results achieved at work.

With regard to the valuation of management skills, some interesting contributions have been provided by Likert (1973), Koontz (1971), Flamholtz (1989), and Zanda, Lacchini & Oricchio (1993).

Likert (1973) differentiates human capital into three macro-categories whose combination defines its general value:

- causal variables, concerning the strategic elements that can be leveraged by the management to create value (such as the decision-making structure, the IT system, the performance targets, etc.);
- intervening variables, aimed at measuring certain characteristics of the workforce (such as the attitude of employees towards their superiors, the trust of top management, the level of collaboration, etc.);
- end-result variables, i.e. the goals that the organisation has managed to achieve in a given period of time (level of productivity, quality of the products, market share achieved, etc.), which are strongly influenced by the other types of variables.

According to this model, there is a cause-effect relation among these three types of variables, which is influenced by time and by a number of other elements such as technological innovation, history of the company, extent of competition, labour situation, etc. Consequently, the dynamics and relationships of human organisation are influenced by different philosophies and leadership models, while company performances depends mostly on the quality of human resources and, therefore, on the status of the intervening variables.

The Likert model (1973) aims to develop a dynamic environment for the understanding and the development of corporate human capital, but does not reach an explicit valuation of the same.

Ultimately, this model does not attribute a monetary value to human capital, but rather limits itself to the analysis of the relations between its different variables, whose manipulation allows the management to increase (or reduce) the value of a given resource, in terms of economic utility, for the company. For this reason, the Author

himself admits that this method needs to be supported by a quantitative instrument to verify the correctness of decisions and to determine whether the management is creating value or not.

The valuation methodology proposed by Koontz (1971) aims to appraise the merits of managers by taking into consideration both their "ability to achieve verifiable objectives" and the "quality of their action as managers". The Author draws up a valuation program consisting of a series of questions aimed at verifying the qualitative aspects of a manager's performance for each of his/her functions. Each question bears a score in relation to a valuation scale (table 1) so that the valuation of each manager is equal to the sum of the scores for each question related to his/her function.

Table 1. Scoring classes

Class	Score
Superior	5
Excellent	4.5 – 4
Good	3.5 – 3
Average	2.5 – 2
Fair	1.5 -1
Inadequate	0

The valuation model proposed by *Zanda* et al. (1993) derives from the combination of the models of Koontz (1971) and Likert (1973). According to the Authors, the valuation of "management skills" can be properly performed with a model built by integrating the Likert scheme with a section of the program developed by Knootz.

In brief, the proposed model is structured as follows:

a) a scheme derived from Likert's theory, which includes control questions for the verification of the effective application of the principle of “supportive relations”, and some elements of the different management systems;

b) a revised version of the valuation program proposed by Knootz to insert and / or eliminate some of the questions included in the valuation program.

For both categories of questions, the Authors suggest the introduction of a valuation scale structured in different classes; a score is assigned to each class, leaving ample discretion to the assessor on the class nomenclature and the extent of the score to be attributed.

However, to reduce the subjectivity of the judgements expressed by the valuators, Zanda et al. (1993) propose to accept the suggestions of Knootz (1971), namely:

- meaningful examples should be provided to justify very high or very low scores;
- managers should also be judged for their ability to value the merits of their subordinates;
- each judgement formulated by a given manager must be reviewed at least by his/her direct hierarchical supervisor.

The valuation methodologies analysed so far, however, if not used synchronously, lead to a biased judgement on the qualitative value of an individual. Therefore, as suggested also by Zanda et al. (1993), it is necessary to adopt a qualitative approach that aims to determinate a value for the results achieved by a subject together with his/her technical and management skills and the behaviour shown at work. This new valuation system should be also inspired by a participatory management philosophy so that, by enhancing the potential of an individual, valuation would be a development tool rather than a control tool.

3.2 Quantitative Valuation

The quantitative valuation of human capital (Celli, 2012) provides a distinction between indirect and direct (or empirical) methods.

The former are based on the assumption that the monetary measure of the element to be valuated needs to be structured by comparison (difference or ratio): the terms to be compared are two different and measurable quantities linked by a quantitative relation (Ferrero, 1988, p. 34).

The latter, on the contrary, lead to the estimate of the economic value of human capital of a given without taking to account neither the other organisational-productive elements into account nor the value of the economic capital of the company itself.

The indirect methods for human capital valuation allow for determining the value by means of a 'comparison' calculation, assuming that the terms of the comparison would be different measures and their quantitative relation would be the value to be quantified.

More specifically, the indirect methodology makes it possible to determine a value that is theoretically attributable to the human organisation by means of a subtraction, assuming that this quantity is equal to the difference between the value of the total economic capital, calculated by means of a criterion based on the discounting of prospective earnings or financial flows, and the value of the economic capital of the same company calculated through the 'complex equity' method, obtained by adding the projected value of the unaccounted productive factors of the company (except for the human element) to the adjusted net equity amount. In formula:

$$Wu = W - K' - V.N.C. \quad (1)$$

Where:

Wu is the economic value of human capital;

W is the value of the economic capital of a company, determined by means of a methodology based on the discounting of prospective cash flows (earnings or financial) , hence leaving the estimated value of the human factor out of consideration;

K ′ is the net equity of a company,, adjusted by the current values of its active and passive elements;

V.N.C. is the economic value of unaccounted tangible and intangible productive factors (with the exclusion, obviously, of human capital alone).

However, in practice, the use of this criterion may be excessively complex and onerous, as its correct application would require not only to estimate the total economic capital through income-based or financial methods, but also to determine the value of the company through the 'complex equity' method.

Moreover, this method implicitly assumes that the differential amount that may exist between the value of the company calculated using the income-based or financial method and the same value obtained with the complex equity method is solely attributable to human capital.

Finally, there is a high level of uncertainty about the appropriateness of the value of human capital obtained with this approach, as its definition requires to unravel different and parallel estimation procedures characterized by a more or less high level of uncertainty about:

a) The value of the economic capital of the company calculated with income-based or financial methods;

b) The adjusted net equity value of the same company;

c) The value of unaccounted tangible and intangible productive factors.

For all these reasons, the use of the indirect valuation method for the estimation of human capital seems appropriate when the estimated value of the economic capital of the company is also deemed to be necessary, since direct methodologies would be preferable when human capital alone needs to be evaluated.

The direct valuation methods include the methods based on the measurement of earnings and financial cash flows, as well as cost-based methods.

4. Methods Based on Income and Financial Value

A valuation process based on the use of the income-based and financial method is characterized by the determination of the value of human capital following an analytical and punctual estimate of the contribution that the latter can make to the total profitability, i.e. the value, discounted to an appropriate rate, of the future economic utility that the individual to be valuated, or the human organisation in its entirety, is supposed to generate in favour of the company.

Among the main methods based on the income-based and financial value, we find (Zanda et al., 1993):

- the Lev and Schwartz model (1971);
- the Gennaro model (1971);
- the Morse model (1973);
- the Ogan model (1976);
- the Myers and Flowers model (1974);

- the Hermanson model (1964);
- the Zanda et al. (1993).

The Lev and Schwartz model (1971) is based on the idea that the value of the contribution made by each employee to the total profitability of a company is equal to the amount of the remuneration paid to him/her, so the model approximates the economic value of a given individual through the discounting of the amount of wages that he/she can receive up to his/her retirement:

$$V_r = \sum_{t=n}^{T} \frac{I(t)}{(1+i)^{t-n}} \quad (2)$$

Where:

Vr indicates the economic value of an employee of age r.

I(t) represents the earnings (wages and salaries) of an employee at time t.

I is the discount rate, which varies from person to person.

T is the retirement age.

Gennaro (1971) proposes a model characterized by a lower complexity and a greater truthfulness of the results. In particular, during the valuation process, the model takes into account the number of members of the company, the time they remain within the organisation and the value of the contribution made by individuals to the total company's profitability.

Specifically, the model empirically estimates the contribution of human capital to the formation of yearly earnings to the extent of 10% of the annual costs borne by any company for the resource in question, approximating the average duration of an individual's employment in the company by adopting the employee turnover rate, so that the possibility that employees may leave the organisation chart before reaching retirement age can be appropriately taken into account.

In other words, according to this orientation, the economic value of a given category of employees in a company is approximated on the basis of the current value of 10% of their wages, in a time interval equal to the reciprocal of the turnover rate of the category in question. In formula:

$$V_{(categ.a)} = (0{,}1) \times (r_{ma}) \times (n_a) \times \left(a_{p\neg i}\right) \quad (3)$$

Where:

$V_{(categ.\ a)}$ is the value of human capital in the category 'a' of employees

0.1 is the coefficient for translating the labour cost in net income

r_{ma} is the average remuneration of the category 'a'

n_a is the number of employees belonging to the category 'a'

p is the reciprocal of the turnover rate of the category 'a'

i is the discount rate (assumed to be equal to the cost of capital).

Considering what has been said before, the total value of the human capital of a given company is equal to the sum of the estimated values for the individual categories of employees that constitute the organisation chart:

$$V = \sum_{j=1}^{K} V(categ.j) \quad (4)$$

Where:

V is the total value of the company's human capital.

V(categ.j) is the value of human capital of the j-th category.

K is the number of categories of employees, from which it is possible to differentiate the company workforce.

The Morse model (1973), in its first version, approximates the value of a company's human capital through the estimate of the current value of the work services (net of the remuneration costs) provided by the employees in a given time frame. In formula:

$$A = \sum_{i=1}^{N} \int_{\tau}^{T} \frac{I_i(t)}{(1+r)^{t-\tau}} dt \quad (5)$$

Where:

A is the net value of human assets.

N is the number of members of the organisation.

τ is the period of analysis.

T is the period of employment of an individual in the organisation (hypothetically identical for all employees).

Ii (t) is the value of the benefits generated by the employee i at time t, net of the costs of remuneration borne by the company.

r is the discount rate.

Subsequently, the Author elaborates an evolution of his model by adding a further element of analysis *X(t)*, indicating the value of the differential services produced by team work (the so-called synergistic effect of group work) compared to the work performed by each employee:

$$A = \sum_{i=1}^{N} \int_{\tau}^{T} \frac{I_t(t)}{(1+r)^{t-\tau}} dt + \int_{\tau}^{T} \frac{X(t)}{(1+r)^{t-\tau}} dt \quad (6)$$

Ultimately, the net value of the company's human capital is equal to the potential flow of gross economic benefits generated by employees on a predetermined period, increased by the synergistic effect of team work and reduced by the costs borne by the company to maintain the human resources themselves:

$$A = \sum_{i=1}^{N} \int_{\tau}^{T} \frac{G_i(t)}{(1+r)^{t-\tau}} dt - \sum_{i=1}^{N} \int_{\tau}^{T} \frac{E_i(t)}{(1+r)^{t-\tau}} dt + \int_{\tau}^{T} \frac{X(t)}{(1+r)^{t-\tau}} dt \quad (7)$$

Where:

$$(V) = \sum_{i=1}^{N} \int_{\tau}^{T} \frac{G_i(t)}{(1+r)^{t-\tau}} dt + \int_{\tau}^{T} \frac{X(t)}{(1+r)^{t-\tau}} dt \quad (8)$$

indicates the gross value of human assets (given by the sum of the value of the total flow of gross economic benefits generated by human capital and the synergistic effect of group work), and:

$$(O) = \sum_{i=1}^{N} \int_{\tau}^{T} \frac{E_i(t)}{(1+r)^{t-\tau}} dt \quad (9)$$

is the amount of the costs borne by the company for maintaining human capital over time (so it follows that (V) = (O) + (A).

While there is a certain degree of contiguity between the Morse model (1973) and the Lev and Schwartz (1971) one, due to the fact that both models use the costs potentially borne by the company to maintain its human resources over time as the basis of analysis, the Morse model is preferable as it takes into consideration: a) the remuneration profiles expected for each employee as the place of the generic income flows, drawn from tax records; b) the synergistic object of group work.

For the Myers-Flowers model (1974), the value of the human capital of a company derives strictly from the work performed by employees whose performance, in turn, depends on their personal qualities such as skills, abilities, health, availability, and aptitudes. Assuming that each of these qualities is necessary for the achievement of good performances, in the Myers and Flowers model (1974) the most important factor that determines the level of performance of human capital are the aptitudes of each individual, with the consequence that the organisational value of a company is given by the difference between the total monetized value (V_{cma}) of these aptitudes at work and the total amount of annual wages and salaries:

$$V = V_{cma} - total\ wages$$

Considering what has been said before, it stands to reason that the basis of the model is the calculation of the monetized value (V_{cma}) of the aptitude to work of each employee, which requires a preliminary calculation of two elements, i.e. the aptitude score (P_a) and its relative weight (P_r).

The aptitude score, expressed in percentage terms, is determined by means of a questionnaire subjected to each member of the organisation, with 20 questions about the level of job satisfaction, the level of cooperation between colleagues, the comprehensibility of the objectives to be achieved, the expectations of managers, and any perceived favouritism. According to the Authors, the questionnaire returns a score that appears to be suitable for providing indications on the existence of any aptitude deficits (if less than 1) or any talent among the employees.

For what concerns the relative weight, it derives from the hierarchical position of each internal employee and the period of his/her permanence in the company.

Once the two variables P_a and P_r have been defined, the monetary value of the aptitudes of the entire company workforce (V_{cma}) is equal to the arithmetic mean of the aptitude scores obtained by each employee, appropriately weighted with the previously determined weights and multiplied by the value of wages and salaries paid to employees each year:

$$V_{cma} = \frac{\sum_{a=1}^{n} P_a \sum_{r=1}^{n} P_r}{n} \times \ total\ wages \tag{10}$$

In the Hermanson model (1964), the value of a company's human capital is given by the current value of the wages paid annually to the workforce appropriately multiplied by a correction coefficient, equal to the ratio between the company's operating profitability (ROI) and the profitability of its reference industry, thus measuring the effectiveness and efficiency of a given company with respect to its competitors.

To avoid the risk of obtaining an overestimated value of the organisation due to the inclusion of the projected earnings provided by any intangible resource in the calculation model, the Author approximates the value of human capital by discounting the flow of future wages at a rate equal to the company's ROI, subsequently adjusting the result according to the relation between the operating profitability of the specific company and that of the reference industry. In formula:

$$CU = \left[\sum_{t=0}^{n} \frac{E(W)_t}{(1+RF_t)^t}\right] \times FC \tag{11}$$

Where:

CU is the value of human capital.

$E(W)_t$ is the amount of wages for the period t.

RF_t is the company ROI projected for the period t.

FC is the correction factor.

n is the period of analysis.

To estimate the correction factor (FC), the Author suggests to calculate the weighted average of the ratios between the company's operating profitability and the operating profitability of its reference industry for the last five years, thus assigning a greater percentage weight to the most recent ratios:

$$FC = \left(\frac{5\times\frac{RA_0}{RS_0}+4\times\frac{RA_1}{RS_1}+3\times\frac{RA_2}{RS_2}+2\times\frac{RA_3}{RS_3}+1\times\frac{RA_4}{RS_4}}{15}\right) \tag{12}$$

Where:

Rat indicates the operating profitability of year t.

RSt indicates the operating profitability of the industry in the same period t.

Zanda et al. (1993) propose a model for estimating the economic value of human capital that is structured into five stages.

In the first one, the firm's yearly turnovers (for example, the last three financial years) are identified, then the projected future is estimated for the next year.

In the second one, the adequacy of the human capital of a given company is assessed by making comparisons with similar companies operating in the same industry, both in qualitative and quantitative terms, on the basis of the current and future organisational needs.

The third stage concerns the estimation of the contribution (*X*) made by the work factor to the total earnings over the years, expressed with the following formula:

$$X = \frac{Labour\ cost \times Total\ turnover}{Total\ cost} \tag{13}$$

In the fourth stage, the model estimates the contribution made by the work factor to the amount of profits over the years

$$COT_t = COU \times \left(N_0 - t\frac{1}{TR}\right) \tag{14}$$

Where:

COT_t is the total contribution to profit at time t.

COU is the unitary contribution to profit, equal to the ratio between the total contribution at time zero in the numerator and the number of employees at time zero (i.e. estimation time) in the denominator.

T indicates time;

1/TR is the inverse of the employee turnover rate.

Finally, in the last stage, discounting is applied to the previously calculated contributions over a number of years equal to the reciprocal of the turnover rate.

In conclusion, according to the model in question, the value of the human capital of a given company can be approximated through the following formula:

$$C.U. = \sum_{t=1}^{1/TR} COU \times \left(N_0 - t\frac{1}{TR}\right)(1+i)^{-t} \quad (15)$$

Table 2. Limits of the methods based on the income-based and financial value of human capital

Model	Theoretical and practical limits
Lev and Schwartz (1971)	• Does not consider that a greater or lesser number of employees might leave the company in the period between the time of analysis and their retirement date; • It does not include the employee turnover rate into the calculation process; • There is a coincidence between the contribution of an employee to the total corporate earnings and the remuneration he/she receives.
Gennaro (1971)	• Arbitrariness in the choice of the translation coefficient of labour costs in net operating income, equal to 10%; • The determination of the qualitative level of the workforce is derived from the amount of wages paid to employees; • The model takes into consideration the number of employees.
Morse (1973)	• The methodological validity of the Morse model proves to be very difficult to ascertain, so that the procedure does not return concrete assumptions for estimating the human capital of a given company.
Myers and Flowers (1974)	• High level of subjectivity tin the monetization of aptitudes, in particular during the stages of attribution of weights and measurement; • Inherent arbitrariness in the assumption of a human capital value that can be approximated simply as the difference between the monetary value of the aptitudes and the amount of the annual wages of the workforce; • Inconsistency of the calculation model, as there are no grounds for assuming that the weighted average of the aptitude scores should be multiplied by the amount of the annual wages for the determination of the monetised value of the aptitudes themselves.
Hermanson (1964)	• The model assumes that the profits of a company are generated to a large extent by its human resources; • The choice of a correction factor equal to the weighted average of the ratios between the company's operating profitability and the operating profitability of the reference industry appears to be arbitrary; • Inappropriateness of ROI for measuring the degree of efficiency and effectiveness achieved by the company.
Zanda, Lacchini & Oricchio (1993)	• The yearly estimate of the contribution made by the work factor to the total earnings is very difficult to determine; • The link between the contribution of the work factor and the amount of the related maintenance costs borne by the company could be misleading; • The choice of taking into account the reciprocal of the turnover rate for the duration of employment causes the model to lose ground in terms of rationality; • It overcomes a number of analytical limits of the methodologies analysed above, in particular for the difficulty of estimating future cash flows attributable to the human factor. This advantage is due to the fact that the model is based on the assumption of an interrelation between the costs borne for the acquisition and/or maintenance of the productive factors and the value of the company turnover.

Source: original research.

4.1 Cost-Based Methods

Cost-based valuation methods approximate the economic value of human capital by means of the analytical determination of both the expenditures and the costs borne (or deemed to be borne) by the company to recruit and place the workforce that is already on service at the time of analysis (recruitment, selection, placement, and training), and the costs for increasing its effectiveness and efficiency (updating and development costs).

Therefore, these methods offer a considerable simplification of the cognitive process and, at the same time, a reduction of the uncertainty related to the use of income-based or financial criteria, as these approaches are based on historical information and related to the postulates of rationality, stability, and objectivity, as well as being in line with the conventional accounting system which considers the costs as implicit substitutes for the economic value.

By means of the methods in question, it is possible to determine the costs borne by the company to benefit from the actual availability of a well-identified human capital, but not the real value of the latter, i.e. the quantification of its inherent potential to generate an economic advantage for the company.

Within this category, there are different configurations for the costs to be used as references for human capital valuation, each characterized by a particular employment criteria and a specific setting:

- The historical cost method
- The opportunity cost method
- The replacement or reproduction cost method
- The multiplier method.

According to the historical cost method, the value of human capital is determined through the capitalization of the costs and expenditures actually borne by the company over time to hire, train, integrate and keep employees efficient in its organisation. According to the prevailing doctrine, costs should include only those elements incurred by the company as an investment in the stock of human resources, ultimately aimed at building and increasing its productivity over time both in terms of quality and quantity; as these costs have to be considered as non-current funding, other costs such as the ordinary and extraordinary remuneration of the same resources should not be taken into account.

More specifically, the labour costs relevant for the definition of the above mentioned value are:

- *acquisition costs in the strict sense*, indicating the initial costs of recruiting (preliminary research aimed at determining the need for personnel, job offers, etc.) and the actual selection costs (reimbursement of travel expenses, questionnaires, compensation to recruitment agencies, etc.).
- *learning costs*, indicating the costs related to the training of the newly hired employees (courses, masters, etc.) and to the informal costs of training on the job (wages of instructors and/or supervisors, differential share of the wage not recoverable in the training period due to the inevitable productivity gap that the newly hired suffers with respect to the company standard, cost of the productivity losses of the employees who have to interact with the novice in the same period);
- *costs for maintaining the efficiency of the organisation*, i.e. costs of refreshing courses aimed at adapting ways of working and knowledge to the continuous changes in the business environment and costs for training and development courses whose function is to empower the future management (executives and managers) to effectively perform the tasks that their new job position involves.

The valuation requires an analytical accounting system within the company, so that costs borne by the company to acquire, train, and retain human capital in the productive system can be measured; moreover, it is necessary to estimate with acceptable precision the so-called 'wasted costs', i.e. the costs associated with the temporary losses of productivity caused by the new employee and by those who interact with him/her during the training period.

There is a high degree of subjectivity that impacts on the valuation process with regard to the qualitative and quantitative split between multi-year labour costs and operating costs (wages, bonuses, etc.), given that the nature of a cost could not be identified with precision at the time the expense was incurred

The opportunity cost method, developed by Hekimian and Jones (1967) and based on the idea that any company resource has an economic value only if it could be allocated to a different job position than his/her current role, postulates the existence of an internal labour market within any company, in which the various business units are competing for those human resources who, thanks to their aptitudes and training, can be allocated in various positions within the organisational structure.

Given that such a methodological criterion lies in the assumption that any productive asset has value only if it can be allocated into an alternative position, it follows that the resulting opportunity-cost must be identified in the differential of value existing among the potential roles, thus requiring the presence of a HR market within the company, where resources are allocated on the basis of transfer prices. Consequently, human resources have to be scarce, contested or contestable by different centres of responsibility (or business units), with the consequence that the value of a company's human capital would reside only in those people who, thanks to their unique professional and relational skills, are difficult to replace and, above all, would be able to perform their duties in different units of the same company, while those employees that might be moved from one function to another (or easily replaceable) would have no value at all.

In fact, according to this model, the directors of the different centres of responsibility of the same company would put forward their own purchase proposals to potential employees according to the target revenues assigned to each function, so that the individuals who are deemed to be the best (most qualified and consequently harder to replace) are then assigned to the unit that wins a real competitive bidding within the company by offering the highest wages and benefits. Therefore, the aforementioned purchase price would actually constitute the opportunity cost of the human resource deemed as scarce, thus being part of the investments made by the purchasing responsibility centre and consequently weighing on its budget.

The replacement cost (or substitute cost) method approximates the value of human capital through the precise quantification of the costs that should be borne by the company under current market conditions (i.e. availability of human resources, compensation levels, etc.) to replace the entire human organisation with a workforce that has to be absolutely equivalent in terms of substantial efficiency. (i.e. number, skills and specific characteristics), thus able to make an economic contribution not inferior to that already provided by the element to be valuated in the same context and market conditions.

Given that the total amount of the necessary costs should be identified for each homogeneous category of employees in order to rebuild an organisation whose effectiveness / efficiency would be in line with that of the company whose human capital value has to be estimated, it is clear that the main application of this approach is to estimate the value of human capital regardless of the costs actually incurred by the company to build its own organisational structure over time.

The method is based on the same categories of historical costs analysed above (including wasted costs and excluding the costs for wages), so it follows that the investment costs related to the determination of the reproduction value are those that the company should bear at the time of analysis to select, train, and place an ideally new human capital but, in fact, equivalent to the one being estimated.

Specifically, the costs to be considered during the application of this method are those related to the research and selection of personnel (ads on newspapers and job portals, fees to be paid to recruitment agencies, etc.), training off-the-job and on-the-job, as well as those directly associated with the recruitment and placement of the candidate in the organisation (trainers' compensations, medical examinations, administration procedures, provision of operating manuals, etc.), in addition to the organisational and reorganisational costs of all the administrative procedures related to the hiring of new employees.

Among the costs to be included in the examination, in addition to those directly associated with HR management, there are the separation costs, i.e. those resulting from the termination of the existing internal relations and from the consequent loss of the synergistic effects that an efficient and unified group is able to generate. It is therefore necessary to consider both the costs of training and those associated with the loss of efficiency that may occur prior to the separation of an individual from the organisation, assuming that he/she has become aware of his/her future dismissal.

Likert has(1973) also proposed a methodological simplification by assuming a value equal to three times the annual amount of wages as the replacement cost of the entire company's human capital:

$$Human\ Capital\ Value = (Annual\ Wages + Severance\ Indemnity) \times 3 \tag{16}$$

The amount of the replacement cost can be approximated by the following formula:

$$CU = [(C_m - C_a)a_{n\neg i}] \times k + T_0 \times (C_r + C_s) \times (1 - p) + C_{sep} \tag{17}$$

Where:

CU is the value of the replacement cost.

C_a indicates the total remuneration costs borne by the company per time unit

C_m indicates the remuneration costs that the company would incur for renewing the workforce.

N is the average duration of employment

I is the discount rate.

K this parameter (variable between 0 and 1) expresses the degree of professionalism of the workforce.

C_r is the average unit cost for recruiting and selecting newly hired employees.

C_s is the average unit cost for the placement of new employees

P is the potential duration of the employment in the company.

T_0 is the number of employees of the company.

C_{sep} are the separation costs.

It is clear that the substitutive methodology in question differs from the historical cost approach due to the fact that it does not limit itself to quantifying the costs borne over time by the company for selecting, training, and maintaining a given human capital, but rather aims to follow different paths and strategies for adapting to the changing market conditions; its goal is to immediately valuate a human capital that is different, yet specular to the one being analysed, in terms of both quantity and quality, i.e. of economic advantage or operational effectiveness and efficiency, respectively.

All things considered, according to the theoretical basis of this method, it would allow for estimating, more than the value of human resources alone, the value of these productive resources for the company to which they belong, with the purpose of measuring the costs of a potential replacement.

The Multiplier method is an evolution of the substitutive criterion, conceived to address the analytical limits that characterize to a variable extent the methods based on costs.

According to this approach, the attribution of value to the company's human capital derives from the application of an appropriate parameter (the multiplier) to a predetermined business metric, considered to be representative of the element to be valuated:

$$Wm = Molt. \times G \tag{18}$$

Where:

Wm indicates the value of the human capital of a given company.

Molt. indicates the multiplicative parameter, determined empirically.

G is a peculiar business metric of the company (the method in question considers the total labour cost per year).

Concerning the value to be attributed to the multiplier, the idea is to anchor the estimation procedure to elements inferable from practical experience, therefore characterized by a lower degree of uncertainty.

5. Conclusion and Discussions

Recent studies and analyses on the processes that allow a company to gain a competitive advantage have identified human capital as a management lever just as important as the most acknowledged elements such as product technology, financial resources, economies of scale.

The term Human Capital was introduced by the economist and Nobel laureate Theodore Schultz (1961) and has only gained ground in the economic world in the last few decades. The concept indicates the knowledge, skills, creativity, and experiences that human resources can provide to a company.

The strength of every organisation lies indeed in the individual who, through his/her intelligence and his/her intellectual background, determines the success of the enterprise and outlines a strategy that benefits not only the economic side, but also the level of service required to keep up to the ever-changing needs of the market.

In this context, an important role is assigned to the knowledge held by individuals, non-uniform and composite in nature, hence often not perfectly expressible.

In short, it is the hidden capital of a company that has to be valued and communicated, and it is more and more frequently defined as intangible by reliable sources.

The future value of a company will increasingly depend on how the company is able to manage and leverage these intangible capitals, which do not appear in traditional balance sheets, but are critical for future success; hence human capital (skills, experiences, abilities) is one of the most important items of the intangible capital of a company.

In particular, it was shown that the estimate of the economic value of human capital refers not to the value of

individuals as such, but to the monetary value of the economic performance of human resources operating within the company and is intrinsically connected to the quality of the staff organization. In fact, only the latter can be considered assets and therefore subject to evaluation.

The examination of the main selected studies has highlighted how two different approaches can be identified for the estimation of human capital, one of a qualitative type and a quantitative one. According to the first approach, the value of human capital is not quantified in direct monetary, but relational terms. It follows that the methods included in this approach neglect the quantitative aspect, privileging the qualitative analysis of the variables that influence the level of organization of the human resources of the company, defining their value.

On the other hand, in the quantitative approach we try to approximate the monetary value of the human resource independently of the remaining jumble of material and immaterial elements that make up the company to which the resource belongs.

Then we identified and described the most popular and influential qualitative and quantitative methods for estimating human capital, outlining the practical limits and advantages for each of them.

From this analysis, taking again the definition of estimate of the economic value mentioned above, it is evident how within the evaluation of the company the methods based on the quantitative approach must be privileged while admitting the usefulness that the qualitative methods can have. The latter, in fact, has meant within the evaluation of human capital because it allows to elaborate a sort of judgment of suitability, that is to say if the company staff is well structured in terms of competence and personal motivation. Furthermore, the qualitative analysis allows to investigate the quality of the management, a factor that determines the specific value of the human capital of the company.

All the above, it follows that in the estimation of the company's human capital the qualitative and quantitative methods should be considered both. Indeed, has been demonstrated that the value of the organisation of a company's workforce varies considerably de pending on the chosen valuation method (Butcher, 1970; Flamholtz, 1972), it is a prevalent opinion in the literature that qualitative and quantitative models, more than antinomic, should be considered as complementary (Zanda, Lacchini, & Onesti, 2013, p. 244).

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