
Bojan Krstić, Ljiljana Bonić*

Abstract

The purpose of this paper is to emphasize the importance of intellectual capital (IC) undisclosed on the assets side on the balance sheet of knowledge enterprises. This capital is very relevant, and managers need to have information about it in order to facilitate effective IC management process. The issue of IC performance measurement has been a matter of growing importance in both academic community and managerial practices for the past two decades. Based on the previous ideas put forward in the literature of knowledge management and IC management, this paper suggests a new methodological framework for overcoming the problem of IC performance measurement in knowledge enterprises. Efficiency of Intellectual Capital (EIC) methodological framework offers practical solutions for measuring the efficiency of total enterprises' IC, as well as the efficiency in the use of all IC components. The EIC framework connects financial accounting valuation and market valuation.

Keywords: intellectual capital, measurement, performance, efficiency

JEL Classification: M21

1. Introduction

Knowledge resources represent basic factors of a new and necessary infrastructure for prosperity in the *new economy* era. The main characteristics of economic prosperity in the global economy is knowledge-based competitiveness. In fact, in the modern economy, where the only certainty is the uncertainty of business conditions, the primary source of firm's competitive advantage is its IC.

IC was considered to be a relatively new and complex category that represents all intangible resources which cannot be fully disclosed on the assets side on the balance sheet. However, these undisclosed resources also generate the economic value and significantly affect profitability and the level of competitiveness of an enterprise. This is the reason why people argue that IC, mainly, represents a hidden asset. These intellectual resources are invisible on the Assets side on the balance sheet (unlike Non-current assets, Current assets, Intangible assets and Goodwill). Not all intellectual resources are recognized and disclosed on the balance sheet in accordance with the IAS 38. This fact and the need to manage the intellectual resources point to the necessity of improving the existing methodologies and approaches to *IC measurement*. This measurement is carried out for the purpose of *controlling the rational economic use of intellectual resources in the business processes of an enterprise*. This is particularly important for the management of knowledge enterprises, in which these resources have a significant share in the book value or the market value.

* Bojan Krstić, University of Niš, Faculty of Economics, Niš, Republic of Serbia
(bojan.krstic@eknfak.ni.ac.rs);
Ljiljana Bonić, University of Niš, Faculty of Economics, Niš, Republic of Serbia
(ljiljana.bonic@eknfak.ni.ac.rs).

Effective IC management in knowledge enterprises requires permanent monitoring of efficiency in the use of multifarious intellectual resources. Namely, this is not only valid for disclosed, but also for undisclosed intellectual resources on the balance sheet because of certain boundaries and limitations of financial reporting system. This paper provides an *EIC conceptual framework* for performance measuring all elements of the IC in knowledge enterprises. The aim of this paper is to design a comprehensive conceptual framework which will overcome managers' and practitioners' problems in performance measuring and valuing this very important asset. This asset significantly affects enterprise competitiveness in a contemporary, competitive, and dynamic context.

2. Theoretical Aspects

2.1 Definitions and components of IC in knowledge enterprises

Many companies are now being sold at a much higher price than their actual book value. The market valuation of companies increasingly relies on the so called intangible factors or invisible items. This approach reflects a huge gap between the market valuation and accounting valuation, causing further interest in a more effective and efficient economic use of intellectual resources in knowledge enterprises.

In contemporary conditions, the accounting theory and practice are faced with a declining importance of the information provided by the system of financial accounting reporting. Namely, there is a need for accounting information to be supplemented by non-financial information, which does not come from financial statements. There is a requirement that the accounting system should adequately disclose the so called invisible assets or intellectual resources on the Assets side on the balance sheet. Therefore, the accountants underline the meaning of the term intangible assets, which actually represents the value of intellectual resources disclosed on the balance sheet.

In the process of IC theory development during the 1990s, many researchers, the pioneers in the field of IC study, usually emphasized different definitions of the IC. Sullivan (1999) defines the IC as the knowledge that can be converted into profit. According to Brennan and Connell (2000), the IC is the capital of the company which is based on knowledge. Edvinsson and Malone (1997) perceive the IC as the possession of knowledge, applied experience, relationships with consumers and professional skills that provide a company with a competitive edge on the market. Lev (2001) claims that the IC represents an intangible factor that will bring considerable economic benefits to the company in the future.

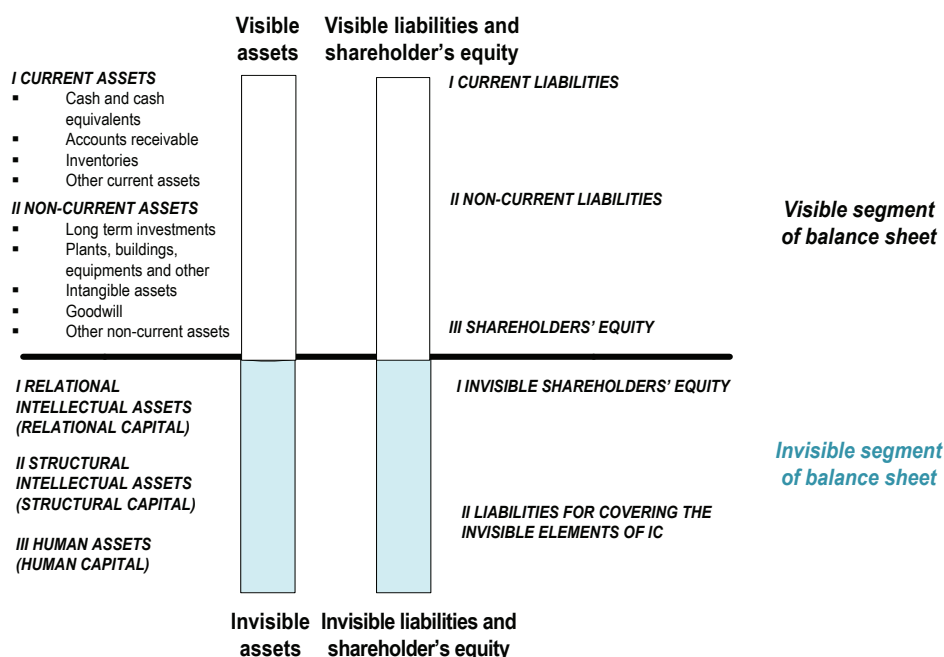
Therefore, the IC is a mechanism that interconnects all visible resources on the balance sheet which contribute to the value creation process, as well as to the improvement of business performance. Also, the IC determines the future potential of a company's growth. There are certain differences in the structure of IC components in the IC literature (Steward, 1997; Roos *et al.*, 2005).

Enterprises develop business activities, and increase profits, market value, competitiveness level, by means of an adequate combination of various elements of the IC. Synergy in creating the value is provided by an amalgamation of different components of the IC. The essence of IC lies at the core of the process of value creation. The value can be created by combining the following components:

- A segment of IC recorded on the balance sheet (*intangible assets and goodwill*);
- A segment of IC undisclosed on the balance sheet (*human, structural, and relational capital*).

Intangible assets and Goodwill are a part of IC disclosed on the balance sheet and presented below the black line in the Figure 1. According to the IAS 38, intangible assets are an identifiable, non-monetary assets without physical substance, such as patents, licenses, trademarks and similar rights and assets. The balance sheet shows only intangible assets which are acquired: a) by purchases, b) as part of business combinations, c) by government grants, or d) by exchanges of assets between companies. After the initial recognition, intangible asset valuation can be performed by the cost model and the revaluation model. There is a general problem related to the recognition of internally generated intangible assets on the balance sheet. However, on the income statement of an enterprise, they are widely recognized as an expense of the period in which it is incurred. The IAS 36 specifies cases of the intangible asset impairment, as well as the impairment of goodwill acquired in business combinations.

Figure 1 | The New Balance Sheet of Knowledge Enterprises



Source: The authors' presentation according to the idea of Sveiby (1997)

The segment of IC that is usually undisclosed on the assets side on the balance sheet (marked as ΔIC) should be calculated according to the formula (Andriessen, 2004, p. 340):

$$\Delta IC = Mc - E \quad (1)$$

and

$$E = As - L - Nci. \quad (2)$$

Mc represents the market capitalization (calculated by multiplying number of shares and market share price), while E stands for the equity attributable to shareholders of the parent enterprise (*i.e.* net assets), As is defined as the book value of assets disclosed on the balance sheet, L is total liabilities (current and non-current), whereas Nci stands for non-controlling (minority) interests or outside stockholders' interest in subsidiaries.

The IC that is undisclosed on the balance sheet (ΔIC) consists of *human* (Hc), *structural* (Sc) and *relational capital* (Rc). So, ΔIC can also be written as:

$$\Delta IC = Hc + Sc + Rc. \quad (3)$$

The human capital (Hc), as human resources in an enterprise, consists of all its managers and other employees with certain competences, expertise, skills, work habits, professional experience, motivation, dedication to the job or to the company, abilities to learn and adapt, as well as other personal performances. The human capital is a determinant of entrepreneurial potential (Jayawarna *et al.*, 2014).

The structural capital (Sc) is a set of resources "that remain in the organization when the employees have left the building" (Edvinsson, 1997), and the value of these resources may partially or may not be found on the assets side on the balance sheet. The knowledge of employees, their skills and abilities create databases, plans, strategies, control systems, information systems, customer lists, innovations, patents, *etc.* Thus, structural capital can be renewed, reproduced, and shared for a long period of time, and can also be used by different employees many times (over and over again) for the purpose of value creation. In the theory of IC, structural capital is grouped into two parts: *organizational capital* and *intellectual property*.

The organizational capital, as an element of the structural IC, includes the following: an organizational structure, business processes, a management team, the philosophy of the top management, innovative organizational culture, information system, information culture, and corporate identity. Organizational capital is difficult to measure, and its balance sheet presentation is almost impossible. Acquisitions are the only cases in which organizational capital, together with other human and relational intellectual resources, can be disclosed as a part of assets on the balance sheet within a unique, consolidated value of *goodwill* created in an enterprise which is the subject of a sale.

The intellectual property, as a segment of the structural IC is a very important resource for enterprises affecting their economic strength and competitive position on the market (Wiederhold, 2014). We can differentiate the intellectual property acquired in the market (externally) from the intellectual property resulted from internal development processes. Externally acquired intellectual resources (in the form of paid licenses or franchises, for example) can be disclosed on the balance sheet as a position called *Intangible assets* in accordance with the IAS 38. Besides this kind of intellectual property, we can point out knowledge (individual and/or organizational), which is being transformed into an internally generated intellectual property of an enterprise. This intellectual property is not disclosed on the balance sheet of an enterprise. In the case of the aforementioned enterprise acquisition, the company-acquirer is entitled to disclose the value of intellectual property (created in an enterprise which is the subject of a sale) on its balance sheet under the position *Goodwill*.

The relational capital (Rc) is created through the relationships with different external stakeholders. This element of the IC is the most difficult to manage in an enterprise because it is

more externally oriented in comparison with its human resources, other infrastructure assets or intellectual property. Therefore, according to Sveiby (1997), this element of the IC is called the external structure. The relational capital consists of relationships with customers, distribution channels, and suppliers. Furthermore, it includes brands and exclusive contracts (such as master franchising, licensing), corporate image and corporate reputation.

All of the above mentioned examples, as well as other elements of intellectual capital cannot be valued due to their specific, intangible nature, and are, therefore, not visible on the balance sheet in Figure 1. *Invisible assets* is a term used to mark all elements of IC undisclosed on the traditional form of the balance sheet. This is the main reason why human, structural, and relational resources are presented below the black line in Figure 1, in a segment of the invisible part of the so called new balance sheet of knowledge enterprises.

2.2 IC performance measurement

Designing an IC performance measurement system is very important for effective IC management. It is necessary to design and to consistently implement the IC measurement system which is suitable for the required IC performance control in a knowledge enterprise. The reasons why enterprises should measure and report on IC performance are reflected in the fact that this information should help in:

- Formulating strategies;
- Evaluating the success of the strategy;
- Communicating the results of IC measurement with external stakeholders, especially to the potential shareholders.

There are a lot of analytical and methodological problems regarding the selection and design of a useful set of IC performance indicators. These problems can be summarized as follows:

- Selecting the partial performance indicators within the categories of IC based on the informational needs of management, characteristics of business activity, industry, *etc.*;
- Ensuring the best possible accuracy of various methodologies for measuring the performance indicators and an adequate information base needed for calculating the IC indicators;
- Identifying all the sources of managerial errors (in the conceptualization, selection and design of IC performance indicators in an enterprise) which can cause the irrelevance of some IC performance indicators.

After formulating the IC strategy, managers should identify the critical success factors of the IC strategy implementation. As a matter of fact, they should determine the intellectual factors that will have the greatest impact on the value creation and business success in the future period. Finally, managers are able to identify the key performance indicators for each segment of the IC (Roos and Roos, 1997). Also, managers should use the "template for designing key performance indicators" for each segment of the IC (Marr, 2006).

Generally, the problem of IC performance measurement has occupied the attention of many researchers in the previous period (Andriessen, 2004). Their efforts resulted in a large number of methodological solutions to the problem of determining the value of total IC and determining the value of various IC elements, such as patents, brands, trademarks, designs, technologies, *etc.*

“The measurement of IC is a relatively young field, without many generally accepted measurement instruments” (Marr, 2008, p. 17). Andriessen (2004) discussed the advantages/strengths and disadvantages/weaknesses of 25 methods for valuing and measuring intangibles (Table 1), which is differentiated according to academic community, terminology distinctions, type of method, and scope of method.

Table 1 | Overview of 25 Methods for Valuing and Measuring Intangibles

Number	Method	Community	Distinctions	Type of method	Scope of method
1	Holistic value approach (Pike and Roos, 2000)	IC	IC	Value measurement	All intangibles
2	Intellectual capital audit (Brooking, 1996)	IC	IC	Value measurement	All intangibles
3	Intellectual capital – index (Roos <i>et al.</i> , 1997)	IC	IC	Measurement	All intangibles
4	Inclusive Value Methodology™ (M’Pherson and Pike, 2001)	IC	IC	Value measurement	All intangibles
5	Intangible asset monitor (Sveiby, 1997)	IC	Intangible assets	Measurement	All intangibles
6	Intellectual capital benchmarking system (Viedma, 2001)	IC	IC	Value assessment	All intangibles
7	Intellectual capital dynamic value (Bounfour, 2002)	IC	IC	Measurement	All intangibles
8	Intellectual capital statement (Mouritsen <i>et al.</i> , 2001)	IC	Knowledge	Measurement	Subset: knowledge management
9	Konrad group (Sveiby <i>et al.</i> , 1989)	IC	Know-how capital	Measurement	Subset, human resource
10	Skandia Navigator (Edvinsson and Malone, 1997)	IC	IC	Measurement	All intangibles
11	Sullivan’s work (Sullivan, 2000)	IC	IC	Financial valuation	Subset: intellectual property
12	Value-Added Intellectual Coefficient™ (Pulic, 2000)	IC	IC	Financial valuation	All intangibles
13	Calculated intangible value (Steward, 1997)	Accounting	Intangible assets	Financial valuation	N/A
14	Citation-weighted patents (Hall <i>et al.</i> , 2001)	Accounting	Patents	Measurement	Subset, patents
15	Intangible scorecard (Gu and Lev, 2002)	Accounting	Intangible assets	Financial valuation	All intangibles
16	iValuing factor (Standfield, 2001)	Accounting	Intangible assets	Financial valuation	-

Table 1 | Continuation

17	Market-to-book ratio (Steward, 1997)	Accounting	None	Financial valuation	All intangibles
18	Tobin's Q (Steward, 1997)	Accounting	None	Financial valuation	All intangibles
19	Value chain scoreboard (Lev, 2001)	Accounting	Intangible assets	Measurement	Subset: innovation
20	Balanced Scorecard (Kaplan and Norton, 1992)	Performance measurement	Intangible assets	Value measurement	Some aspect of intangible resources
21	Economic Value Added (Steward, 1994)	Performance measurement	None	Financial valuation	–
22	Options approach (Dixit and Pindyck, 2003)	Valuation	None	Financial valuation	All or subset
23	Technology factor (Khoury, 1998)	Valuation	Intangible assets	Financial valuation	Subset: technology
24	Valuation approaches (Reilly and Schweis, 1999)	Valuation	None	Financial valuation	All or subset
25	Human resource accounting (Sackmann <i>et al.</i> , 1989)	Human resource	Human resources	Value measurement	Subset: human resources

Source: According to Andriessen (2004, pp. 57, 59, 71, 88, 105, 110)

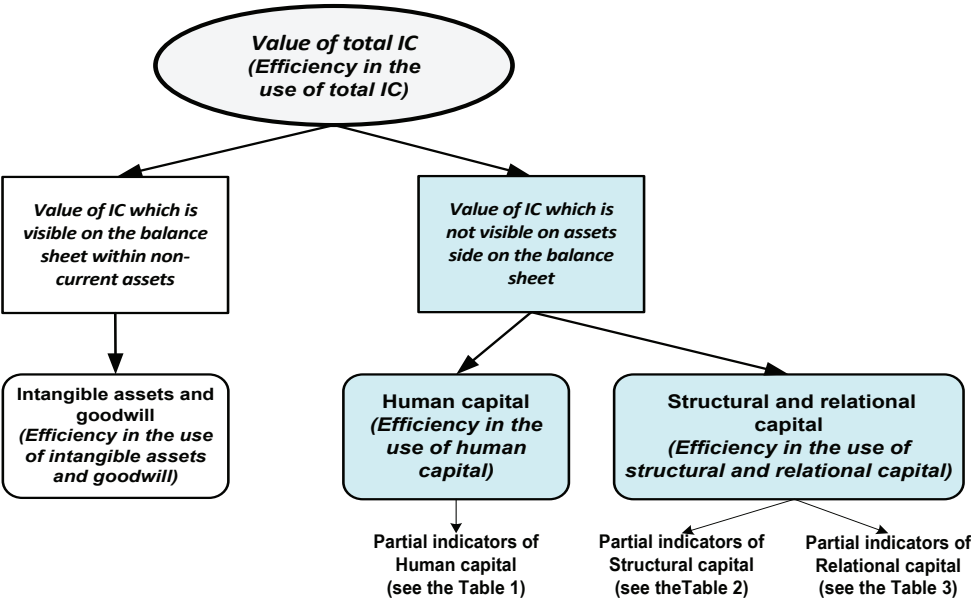
There are quite long lists of available methods for IC valuing and measuring. However, these lists of methods are not exhaustive. There are other methods presented in IC theory and practice. Presented methods in Table 1 suffer from certain limitations and weaknesses in IC performance measurement in terms of ease of use, finding solutions to the design problem, information base for calculation, limited scope, *etc.*

3. EIC Methodological Framework for IC Performance Measurement

The problems related to the IC performance measurement, as well as the difficulties which arise when measuring certain partial segments of the IC, spring from the intangible nature of different characteristics of multifarious intellectual resources. The Efficiency of Intellectual Capital (EIC) methodological framework offers practical solutions for measuring the efficiency of total enterprises' IC, as well as the efficiency in the use of all IC components. In order to solve very complex and multidimensional IC measurement problems, we need a broad set of the following indicators (Figure 2):

- *The value of the total IC*, as a sum of both visible and invisible IC on the balance sheet;
- *The value of IC that is recorded on the balance sheet within the Non-current assets - Intangible assets and Goodwill (Iag)*;
- *The value of IC that is undisclosed on the assets side on the balance sheet*. It is calculated as a summation of the value of Human (*Hc*) and the value of Structural and relational capital (*SRc*);
- *A set of many partial performance indicators* within separate components of IC – human, structural and relational capital (Tables 2, 3, 4).

Figure 2 | The EIC Conceptual Framework of IC Performance Indicators



3.1 Aggregate indicator of the IC and partial performance indicators of the human, structural and relational capital

Total intellectual capital (IC), consisting of the value of the IC disclosed on the balance sheet (*Iag*) and the value of the IC undisclosed on the balance sheet (ΔIC). The aggregate indicator of the IC can be presented in the following way:

$$IC = Iag + \Delta IC \tag{4}$$

or

$$IC = Iag + Hc + SRc. \tag{5}$$

Besides the relevance of calculating the aggregate indicator of the value of IC, as well as the value of human capital (*Hc*), and the value of structural and relation capital (*SRc*), the control of a set of multifarious, *partial performance indicators* for IC components are much more relevant for everyday managerial purposes (Tables 1, 2, 3).

For that purpose, we can define a set of many partial performance indicators (financial and, particularly, non-financial) within separate IC components - human, structural, and relational capital. Non-financial indicators of IC can be inherently qualitative and quantitative.

Measuring the human capital performance is based on several indicators, grouped into the following measurement dimensions shown in the first column of Table 1, as well as a set of partial performance indicators for monitoring and controlling human capital.

Table 2 | A Set of Human Capital Performance Indicators

Dimensions	Indicators
Productivity	<ul style="list-style-type: none"> • Productivity of human capital (profit, cash flow and sales <i>per</i> employee) • Sales and profit <i>per</i> expert / professional (which directly contributes to value creation) • The share of employees in the total number of employees who successfully realize the defined goals in a certain period • Number of employees/managers who are rewarded for outstanding work or business performance
Knowledge and education	<ul style="list-style-type: none"> • Workforce qualification structure of an enterprise • The willingness of employees to develop additional skills • Average employee satisfaction regarding the development of individual competencies • The number of useful accepted and applied ideas and suggestions for innovations offered by the employees • Average annual investment in training <i>per</i> employee • Number of hours of training of new employees (working in an enterprise up to 1 year)
Experience and stability of employees	<ul style="list-style-type: none"> • The average length of working period in an enterprise expressed in years <i>per</i> employee • Average work experience of each employee in a workplace in a certain enterprise • The total number of years in the profession • Fluctuation of experts/professionals • The rate of knowledge worker retention
Management and leadership competencies	<ul style="list-style-type: none"> • The extent to which the top management team is visionary • Quality of management (analysis of the effectiveness of decision-making process) • To what extent the style of decision-making can be characterized as participatory • The annual assessment of the profile and performance of managers • The number of managerial staff vs. non-managerial staff • The number of days and the cost of managers' education • The number of managers who qualify for getting financial incentives
Motivation	<ul style="list-style-type: none"> • The average salary/wage in an enterprise • Monitoring the requirements and motives of employees • The position of an enterprise within the industry according to the average net salary/wage • The willingness of employees to recommend their enterprise as a better workplace • The list of reasons for leaving an enterprise • Impact of the remuneration system in an enterprise on employees' motivation • The percentage of the total number of employees in an enterprise who are qualified for obtaining incentives

Measuring the structural capital performance is based on many indicators shown in Table 2.

Table 3 | A Set of Structural Capital Performance Indicators

Dimensions	Indicators
Performance of organizational architecture	<ul style="list-style-type: none"> • The adequacy of the organizational structure (in the sense of alignment with the strategy) • Compliance of management philosophy with enterprise objectives • Quality of management team structure • Key values and attitudes of a member of a top management team • Key values and norms of organizational culture • The readiness of employees and managers to change themselves • The degree of dedication (loyalty) of the staff to the organization • Number of conflicts among employees • The ability of the top management team to assess the risks • The corporate identity
Management processes and other business processes	<ul style="list-style-type: none"> • Effectiveness/efficiency of the following processes: performance planning, measurement, and analysis • Execution time of the work processes • Business process flexibility • Business process outcomes and results • Quality of business processes • Number of certificates for process quality
Information-communication technology and systems	<ul style="list-style-type: none"> • The % of IT costs in total costs • IT training at the organizational level • Number of accesses to the database • Number of new inputs in the database • Number of enterprise's website visitors
Innovativeness and intellectual property	<ul style="list-style-type: none"> • The number of R&D projects • Using the services of specialized R&D laboratories and research institutes • A number of new products launched to the market • Average time of the new product development • Number of research centres and laboratories • The number of registered patents and trademarks • Expenditures on intellectual property protection • Violations of intellectual property rights • Number of sold licenses (incomes) • Number of acquired and paid licenses (expenditures)

Measuring the relational capital performance is based on many indicators presented in Table 3.

There are quite long lists of possible performance indicators of human, structural and relational capital. These lists of indicators are not exhaustive, but serve as an initial framework for IC managers in knowledge enterprises.

Table 4 | A Set of Relational Capital Performance Indicators

Dimensions	Indicators
Relations with customers	<ul style="list-style-type: none"> • Net present value of customers • Customer satisfaction index • Customer retention rate • Customer profitability • Sales per customer and market share • Timeliness and accuracy related to the product delivery to the customers • Brand image and value • Marketing expenses • Rate of lost customers • Rate of acquired customers
Relations with suppliers and strategic partners	<ul style="list-style-type: none"> • Satisfaction with the supplier as a partner of an enterprise • The average value of purchases per supplier • Number of proposals given by suppliers • Complaints from suppliers • Timeliness in delivery of goods by suppliers • Total cost of procurement • Joint venture contracts • Effectiveness in the implementation of cooperation programs • Supply chain performance
Relations with the community	<ul style="list-style-type: none"> • The level of costs for environmental protection programs • Energy efficiency • The number of products which can be recycled • The rate of gas emissions reduction • Number of ecological complaints within one year or reporting period • The value of charitable donations • The level of investment in local infrastructure
Image	<ul style="list-style-type: none"> • Evaluation of the enterprise image based on the interviews with external stakeholders • The image of an enterprise among its employees • The presence of an enterprise in the media • Positive and negative image of an enterprise • Assessment of strengths and weaknesses of the image in terms of its contribution to future financial performance and competitive advantage

3.2 Efficiency in the use of intangible assets, human, structural and relational capital

The measurement concept of the IC efficiency is based upon the following presuppositions:

- The *efficiency* as a performance indicator is a ratio which is mathematically constructed as the quotient between *output* and *input*, as well as between the *economic result* (the numerator) and *the amount of investment in certain assets* (the denominator).
- In knowledge enterprises, the IC combined with other resources creates a special value of economic result, which is called the *Intellectual capital value added (ICVA)*. *The intellectual resources are prevalent in a knowledge enterprise resource portfolio and play the greatest role in a value creation process.*

- Efficiency in the use of assets which are segments of the total IC can be controlled by the following indicators, such as:
 - *Efficiency in the use of intangible assets and goodwill (Eiag)*,
 - *Efficiency in the use of human capital (Ehc)*,
 - *Efficiency in the use of structural and relational capital (Esrc)*.
- Measuring the value of total IC is relevant, but it is even more important to measure *Efficiency in the use of total intellectual capital (EIC)*.

Drawing on the earlier research (Pulic, 2000; M'Pherson and Pike, 2001; Pulic, 2004; Andriessen, 2004) and, in particular, the critical analyses of the findings put forward by those studies, the EIC methodological framework indicates the elements needed for the calculation. In addition to this, we want to point out that human resources are the most important factor of the business success of an enterprise in the knowledge economy era. This is the reason why human resources cannot be exclusively treated only as a source of expenditure or a cost driver, but as human assets (Pulic, 2000). If we appreciate this opinion, the *earnings before interest and tax (EBIT)* as the financial result requires a correction by several categories which would lead to the creation of the category of the *Intellectual capital value added (ICVA)*. It can be calculated by the following formula:

$$ICVA = EBIT + D_{fa} + Am_{ia} + I_{ml} + P_e . \quad (6)$$

Here the D_{fa} is the depreciation of non-current assets, Am_{ia} denotes the amortization of intangible assets with an identifiable useful life, I_{ml} represents an impairment loss of intangible assets with indefinite useful lives (Goodwill), and P_e stands for personal expenses or gross salary of managers and employees (net salary + salary taxes), other investments in human resources development such as cost of education, training, etc. Another way of calculating the *Intellectual capital value added (ICVA)* is:

$$ICVA = EBITDA + P_e . \quad (7)$$

EBITDA denotes the *earnings before interest and tax, depreciation and amortization*.

The control of economic efficiency in the use of *Intangible assets and goodwill*, as a part of IC that is visible or recorded on the assets side of the balance sheet requires the measurement of the *Efficiency in the use of intangible assets and goodwill (Eiag)*. This indicator shows how many units of the *ICVA* can be generated *per* every 100 monetary units of the employed *Intangible assets and goodwill*. This is actually the measure of return on intangible assets and goodwill and the formula for the calculation is:

$$Eiag = \frac{ICVA}{Iag} . \quad (8)$$

The value of human capital (Hc) is calculated as a summation of Pe and stimulative incentives and bonuses for managers and other employees. Incentives/bonuses are paid off to managers and other employees at the end of the fiscal year in case of surpassing the targeted business and individual performance in the compensation plans and budgets.

The rational economic use of human and other resources should contribute to the creation of the *ICVA*. The *Efficiency in the use of human capital (Ehc)*, as an indicator of the productive use of human resources of an enterprise, is calculated by the following formula:

$$Ehc = \frac{ICVA}{Hc}. \quad (9)$$

Structural capital is a quite difficult to quantify in many enterprises, due to the fact that there are numerous elements which comprise this category, such as organizational structure, organizational culture, information systems, *etc.* The same is valid for structural capital as for the other kinds of the IC, and manager's role is providing its efficient use in order to create the *ICVA*.

In addition, the relational capital is very difficult to determine if we consider its content, such as the relations with key shareholders, corporate image and reputation. However, relational capital can also contribute to the *ICVA* creation.

If we underscore the problem of quantifying the value of both structural and relational capital (*SRc*), there is a possibility of calculating their cumulative value by using the following formula:

$$SRc = IC - (Iag + Hc) \quad (10)$$

or

$$SRc = \Delta IC - Hc. \quad (11)$$

The *SRc* represents only a part of the total value of the structural and relational capital of an enterprise. Actually, *SRc* represents a part of the intangible assets which are not incorporated within the value of the *Iag* because of the rigorous criteria in the IAS 38. For example, patents acquired from other enterprises are disclosed as assets on the balance sheet within the *Iag*. However, internally developed, registered or protected innovations (patents) are not recognized and disclosed on the balance sheet.

The *Efficiency in the use of structural and relational capital* (*Esrc*) as a performance indicator can be found using the following formula:

$$Esrc = \frac{ICVA}{SRc}. \quad (12)$$

The measurement of total intellectual capital efficiency (visible and invisible on the balance sheet) should incorporate all IC components (*Iag*, *Hc*, *SRc*) which, when combined with other resources in an enterprise create the *ICVA*. The *Efficiency in the use of total IC* (*EIC* indicator) is calculated as:

$$EIC = \frac{ICVA}{IC}. \quad (13)$$

When we multiply *EIC* by 100%, this absolute coefficient becomes the rate of return on total IC. It indicates how many monetary units of *ICVA* are generated *per* every 100 monetary units of the total IC.

4. Software AG: An Example that EIC Methodological Framework Really Works

Software AG is a global leader in Business Process Excellence (*Annual Report, 2011*). This knowledge enterprise enjoys a four-decade old tradition. *Software AG* is an embodiment of a knowledge enterprise. This can be confirmed by the ratio which represents the percentage of *Intangible assets and goodwill* (*Iag*) in the value of Assets (*As*). According to the financial information presented on a consolidated balance sheet (Table 5) within the annual report for 2011 this ratio is 59.52%.

Table 5 | Consolidated Balance Sheet of Software AG as of December 31, 2011, Prepared for Analyses

ASSETS	(In € thousands)	EQUITY AND LIABILITIES	(In € thousands)
I Current assets	574,285	I Current liabilities	381,565
1. Cash and cash equivalents	216,479	1. Deferred income	105,269
2. Prepaid expenses	8,656	2. Provisions for taxes and other provisions	103,486
3. Trade receivables, other receivables and other assets	348,645	3. Trade payables	58,066
4. Inventories	505	4. Financial liabilities and other liabilities	114,744
II Non-current assets	1,106,410	II Non-current liabilities	347,648
1. Deferred taxes	18,731	1. Deferred income	679
2. Prepaid expenses	1,256	2. Deferred taxes	36,745
3. Long-term financial investment	20,633	3. Provisions for pensions and other provisions	49,695
4. Property, plant and equipment	65,365	4. Trade payables	453
5. Intangible assets and goodwill	1,000,425	5. Financial liabilities and other liabilities	260,076
		III Equity	951,482
		1. Retained earnings	867,053
		2. Capital reserve	35,716
		3. Other reserves	– 37,095
		4. Treasury shares	– 1,675
		5. Share capital	86,828
		6. Attributable to shareholders of Software AG	950,827
		7. Non-controlling interests	655
Total	1,680,695	Total	1,680,695

Source: Software AG, Annual Report, 2011

The Consolidated income statement (Table 6) and Consolidated balance sheet, Notes to the consolidated financial statement, the Management report, as well as the other information within the *Annual Report of Software AG* for 2011–2013, serve as a basis for the calculation of the *Eiag*, *Ehc*, *Esrc*, and *EIC* as IC efficiency indicators (Table 7).

Table 6 | Consolidated Income Statement of Software AG (2011), Prepared for Analyses

Number	Elements	(In € thousands)
1	Total revenue	1,098,334
2	Cost of sales	-442,147
3	<i>Gross profit</i> (1-2)	656,187
4	Research and development expenses	-88,038
5	Sales, marketing and distribution expenses	-230,227
6	General and administrative expenses	-75,110
7	<i>Operating result</i> (3-4-5-6)	262,812
8	Net other income/expenses (result)	+6,384
9	Net financial income/expense (result)	-9,902
10	<i>Earnings before income taxes</i> (7±8±9)	259,294
11	Income taxes	-71,110
12	Other taxes	-10,975
13	<i>Net income</i> (10-11-12)	177,209
14	<i>Earnings before interest and taxes, EBIT</i> (13+12+11±9)	269,196
15	EBITDA (EBIT+ Depreciation + Amortization)	315,500

Source: Software AG, Annual Report, 2011

Hc shows the highest efficiency, *Iag* shows slightly lower efficiency, while *SRc* shows the lowest efficiency (Table 6). Namely, the *Efficiency in the use of human capital* (*Ehc*) in 2011 is 157.23%. It indicates that €157.23 of the *ICVA* are generated *per* every €100 of the employed Human capital. The *Efficiency in the use of intangible assets and goodwill* (*Eiag*) is 80.00%. Also, it indicates that €80.00 of the *ICVA* are generated *per* every €100 of employed *Intangible assets and goodwill*. The *Efficiency in the use of structural and relational capital* (*Esrc*) of *Software AG* for 2011 is 78.21%. This measure indicates that €78.21 of the *ICVA* are generated *per* every €100 of the employed *Structural and relational capital*.

Table 7 | Efficiency Indicators in Software AG

Number	Elements	Amount
1	Number of shares	86,827,845
2	Market price <i>per share</i>	€28.6
3	Mc (1x2)	€2,483,276,367
4	As	€1,680,695,000
5	$E = As - L - Nci$	€950,827,000
6	ΔIC (3–5)	€1,532,449,367
7	Iag	€1,000,425,000
8	IC (6+7)	€2,532,874,367
9	Pe	€484,884,000
10	The total sum of stimulative incentives	€24,179,000
11	Hc (9+10)	€509,063,000
12	SRc (6–11)	€1,023,386,367
13	$EBIDTA$	€315,500,000
14	$ICVA$ (13+9)	€ 800,384,000
15	$Eiag$ (14:7) x 100	80.00%
16	Ehc (14:11) x 100	157.23%
17	$Esrc$ (14:12) x 100	78.21%
18	Eic (14:8) x 100	31.60%
19	$EBIT$	€269,196,000
20	Net income	€177,209,000
21	Net income attributable to shareholders	€176,960,000

Note: For the calculation we used the data from Annual Report 2011 of Software AG

The *Efficiency in the use of total IC (EIC)* of Software AG in 2011 is 31.60%. This performance measure indicates that €31.60 of *ICVA* are generated *per* every €100 of employed *IC*.

5. Conclusion

The EIC methodological framework represents a satisfactory solution to the multidimensional and complex problem of the IC performance measurement in knowledge enterprises, which arises from intangible and non-material nature of a heterogeneous set of intellectual resources, and consequently, the real, reasonable and justifiable limitations of financial accounting

reporting standards. The impossibility to value the total IC by means of the financial accounting system has imposed a methodological necessity – the use of information related to the market valuation. The link between the financial accounting valuation and market valuation (or accounting and market information) ensures a design of the special indicator that quantifies the *efficiency in the use of total IC (EIC)*.

Additionally, the EIC method offers a solution for quantifying the efficiency of human, structural and relational capital, which are undisclosed on the balance sheet in knowledge enterprise. This methodology is applicable to joint stock companies because of the direct market valuation of their assets. The limitation of the EIC methodology application can be noticed in the case of joint stock companies which are not present at the stock market. Enterprises, which are, from the legal point of view, not joint stock companies, also suffer from the same limitation.

As far as the joint stock companies which are not present on the stock market are concerned, the use of the EIC method requires implementation of a solution to the calculation of the market value (market capitalization) according to equity multiples and a well-known peer group analysis.

Regardless of the problem of market value calculation in case of unlisted joint stock companies, the EIC method is quite easy to apply to the listed stock companies, which is really its great advantage. Owing to this fact, the EIC method can be used in all knowledge enterprises in different industries. In order to support the previous claim, we point out the fact that the EIC uses publicly available information for calculating all IC efficiency indicators. Namely, the *EIC* uses the information from the annual financial accounting report (the balance sheet, the income statement, the notes to the financial statement, the management report), as well as the information from the stock exchange report. The use of the publicly available information can be seen as the second advantage of the practical implementation of the EIC tool.

However, it can be argued that the EIC methodology is consistent with respect to calculating the efficiency indicators as output/input ratios. In fact, all IC efficiency indicators (*Eiag*, *Ehc*, *Esrc*, *EIC*) in the EIC method are mathematically calculated as the ratio of the value of a relevant economic output (as the numerator) and the value of a relevant economic input (as the denominator).

In addition, the intellectual capital value added (*ICVA*) is a satisfactory indicator of intellectual capacity in the knowledge enterprises, whose share of the value of intellectual resources (*Intangible asset and goodwill - Iag*) in the value of total assets is considerable. The *ICVA* is used as a numerator in all efficiency indicators (*Eiag*, *Ehc*, *Esrc*, *EIC*) in the EIC methodology. This is because all intellectual resources, in a knowledge enterprise, are used together in business processes and produce a synergistic effect on the created value.

The great advantages of the EIC method lie in the fact that it provides the efficiency control in the use of total IC and efficiency in the use of assets which are segments of the total IC in the regular periods of accounting reporting. The intention of the authors is to illustrate the application of the EIC model in one accounting period, but this model may be applied for the purpose of different aspects of business performance analysis. Taking into consideration the information about the current value of IC efficiency indicators (*Eiag*, *Ehc*, *Esrc*, *EIC*) for successive periods, the management is able to undertake a trend analysis of IC efficiency indicators. In this way, the management of a knowledge enterprise has an opportunity to monitor changes in efficiency indicators that is very important for effective IC management process. Furthermore, the EIC framework provides a standpoint for a comparative analysis of the efficiency in the use of intellectual resources in comparison with other competitors in

the industry. The EIC is particularly useful for IC performance benchmarking that is used for a comparative analysis by the leading knowledge enterprises in the industry.

To conclude, we can claim that the EIC methodology contributes to the efficient strategic control. In addition, it is especially helpful in the IC strategy control and control of the IC components' strategies. Therefore, it represents a highly valuable tool for managing knowledge enterprises.

References

- Andriessen, D. (2004). *Making Sense of Intellectual Capital*. Oxford, UK: Elsevier Butterworth-Heinemann.
- Bounfour, A. (2002). *How to Measure Intellectual Capital's Dynamic Value: The IC-dVAL Approach*. Presented at the 5th World Congress on Intellectual Capital, McMaster University, Hamilton, Ontario, Canada.
- Brennan, N., Connell, B. (2000). IC: Current Issues and Policy Implications. *Journal of Intellectual Capital*, 1(3), 206–240. DOI: 10.1108/14691930010350792.
- Brooking, A. (1996). *Intellectual Capital: Core Asset for the Third Millennium*. London: International Thomson Business Press.
- Dixit, A. K., Pindyck, R. S. (2003). The Options Approach to Capital Investment. *International Library of Critical Writings in Economics*, 163, pp. 570–582.
- Edvinsson, L., Malone, M. S. (1997). *IC: Realizing Your Company's True Value by Finding its Hidden Brainpower*. New York: Harper Business.
- Edvinsson, L. (1997). Developing IC at Skandia. *Long Range Planning*, 30(3), 366–373. DOI: 10.1016/s0024-6301(97)00016-2.
- Gu, F., Lev, B. (2002). *Intangible Assets – Measurement, Drivers, Usefulness*. Available at: http://questromapps.bu.edu/qstnet/Personal/Faculty/Publication/pubUploads/Gu_Feng_05.pdf?wid=1482
- Hall, B. H., Jaffe, A., Trajtenberg, M. (2001). *Market Value and Patent Citations: A First Look*. University of California at Berkley working papers, Department of Economics. Available at: <http://repositories.cdlib.org/iber/econ/E01-304>
- Jayawarna, D., Jones, O., Macpherson, A. (2014). Entrepreneurial Potential: The Role of Human and Cultural Capitals. *International Small Business Journal*, 32(8), 918–943. DOI: 10.1177/0266242614525795.
- Kaplan, R., Norton, D. (1992). Putting the Balanced Scorecard as a Strategic Management System, in *Harvard Business Review on Measuring Corporate Performance*. Boston: Harvard Business School Press, pp. 183–211.
- Khoury, S. (1998). Valuing Intellectual Properties, in Sullivan, P. H., ed., *Profiting from Intellectual Capital: Extracting Value from Innovation*. New York: John Wiley & Sons, pp. 335–356.
- Lev, B. (2001). *Intangibles: Management, Measurement, and Reporting*. Washington D.C.: Brookings Institution Press.
- M'Pherson, P. K., Pike, S. (2001). Accounting, Empirical Measurement and Intellectual Capital. *Journal of Intellectual Capital*, 2(3), 246–260. DOI: 10.1108/eum0000000005659.
- Marr, B. (2006). *Strategic Performance Management: Leveraging and Measuring Your Intangible Value Drivers*. Oxford: Butterworth-Heinemann.
- Marr, B. (2008). *Impact Future Value: How to Manage your Intellectual Capital*. The Society of Management Accountants of Canada, The American Institute of Certified Public Accountants and the Chartered Institute of management Accountants.

- Mouritsen, J., Larsen, H. T., Bukh, P. N., Johansen, M. R. (2001). Reading an Intellectual Capital Statement: Describing and Prescribing Knowledge Management Strategies. *Journal of Intellectual Capital*, 2(4), 359–383. DOI: 10.1108/eum0000000006086.
- Pike, S., Roos, G. (2000). Intellectual Capital Measurement and Holistic Value Approach (HVA). *Works Institute Journal (Japan)*, 42, October– November.
- Pulic, A. (2000). VAIC™ – An Accounting Tool for IC Management. *International Journal of Technology Management*, 20(5-8), 702–714. DOI: 10.1504/ijtm.2000.002891.
- Pulic, A., (2004). Intellectual Capital - Does It Create or Destroy Value? *Measuring Business Excellence*, 8(1), 62–68. DOI: 10.1108/13683040410524757.
- Reilly, R., Schweihs, R. (1999). *Valuing Intangible Assets*. New York: McGraw-Hill.
- Roos, G., Roos, J. (1997). Measuring Your Company's Intellectual Performance. *Long Range Planning*, 30(3), 413–426. DOI: 10.1016/s0024-6301(97)90260-0.
- Roos, G., Roos, J., Dragonetti, N., Edvinsson, L. (1997). *IC: Navigating in the New Business Landscape*. New York: New York University Press.
- Roos, G., Pike, S., Fernstrom, L. (2005). *Managing IC in Practice*. Oxford, GB: Butterworth-Heinemann.
- Sackman, S., Flamholz, E., Bullen, M. (1989). Human Resource Accounting – A State of the Art Review. *Journal of Accounting Literature*, 8, pp. 235–264.
- Software AG (2012). *Software AG Annual Report 2011*. [Retrieved 2015-3-20] Available at: http://www.softwareag.com/us/images/sag_q1_en_web_X_120524_tcm89-98760.pdf
- Standfield, K. (2001). Time Capital and Intangible Accounting: The Approaches to Intellectual Capital, in Malhotra, Y., ed., *Knowledge Management and Business Model Innovation*. Hershey, PA: Idea Group Publishing, pp. 316–324.
- Steward, G. B. (1994). EVA: Fact and Fantasy. *Journal of Applied Corporate Finance*, 7(2), 71–84.
- Steward, T. (1997). *IC: The New Wealth of Organizations*. New York, NY: Doubleday.
- Sullivan, P. (1999). Profiting from Intellectual Capital. *Journal of Knowledge Management*, 3(2), 132–143. DOI: 10.1108/13673279910275585.
- Sullivan, P. H. (2000). *Value Driven Intellectual Capital: How to Convert Intangible Corporate Assets into Market Value*. New York: John Wiley & Sons.
- Sveiby, K. E. et al. (1989). *The Invisible Balance Sheet*. Available at: <http://www.sveiby.com/articles/IntangAss/DenOsznliga.pdf>
- Sveiby, K. E. (1997). *The New Organizational Wealth – Managing & Measuring Knowledge-Based Assets*. San Francisco, USA: Berrett - Koehler Publishers, Inc.
- Viedma, M. (2001). ICBS Intellectual Capital Benchmarking System. *Journal of Intellectual Capital*, 2(2), 148–164. DOI: 10.1108/14691930110385937.
- Wiederhold, G. (2014). *Valuing Intellectual Capital – Multinationals and Taxhavens*. New York: Springer.