

Intellectual capital of the European Union 2008

Dr. Christiaan D. Stam
Dr. Daan G. Andriessen

Centre for Research in Intellectual Capital
INHolland University of Applied Sciences,
PO box 558, 2003 RN Haarlem, The Netherlands

christiaan.stam@inholland.nl
daan.andriessen@inholland.nl

Abstract

In 2004 the report *Intellectual capital of the European Union* was published (Andriessen and Stam, 2004). This report provided insight in the value of the intellectual capital of the 15 countries of the European Union, in relationship to the goals set by the European Council in March 2000. Since this report, the EU grew from 15 to 27 countries and the Lisbon goals were reformulated in 2005. The aim of this paper is to repeat the measurement of the intellectual capital (IC) of the *enlarged* European Union (EU) in relationship to the *new* Lisbon goals.

In order to become the most competitive and dynamic knowledge-based economy, the EU decided to focus on “delivering stronger, lasting growth and creating more and better jobs” (CEC, 2005d, p.7). In this paper we translate this overall goal in 38 indicators. As the data was not available for all the new member states, we decided to limit our paper to the so-called EU-19.

Based on our measurements we conclude that the EU-19 is still behind Japan and far behind the USA, however the EU is catching up as both Japan and the USA have considerably lower growth figures than the EU-19. From an IC perspective, the EU is geographically divided. The Nordic countries are still the best performing countries. The southern European countries and the new member states stay behind. However, as the new member states invest more in their IC, it might be expected that their positions will improve in the future.

The aim of our paper was to measure the progress of the Lisbon Agenda for growth and jobs. Based on our measurements we conclude that the EU-19 is successful in terms of creating more and better jobs, but not successful in terms of delivering stronger, lasting growth.

Keywords:

Intellectual capital, intellectual capital of nations, European Union, Lisbon strategy, measurement

1 Introduction

In 2004 Andriessen and Stam published the report *Intellectual Capital of the European Union* (2004). In this report they provided insight into the value of the intellectual capital of the 15 countries of the European Union, in relation to the goals set by the European Council in Lisbon in March 2000. The main goal of this so called 'Lisbon strategy' was to become the most competitive and dynamic knowledge-based economy in the world in 2010 (EP, 2000). Since this report in 2004, the situation has changed radically. First, the European Union grew from 15 to 27 member states. Second, as the achievements with regard to the Lisbon Goals were disappointing, the Lisbon goals were reformulated in 2005. Based on a mid-term review (CEC, 2004) the European Commission proposed to refocus the Lisbon agenda on growth and jobs (EU-Council, 2005).

Considering these two important developments, we think it is time to repeat the measurement of the intellectual capital of the *enlarged* European Union, in order to assess the progress with regard to the *new* Lisbon Goals. In this paper we first briefly introduce the concepts of intellectual capital and intellectual capital of nations. Next we describe the methodology used. Then we explore the new Lisbon goals and translate them in indicators that can be measured. Finally, we present the findings of our measurements and draw conclusions about the progress with regard to the Lisbon goals.

2 Intellectual capital of nations

We have entered an economy in which the competitive advantage has shifted from material and financial assets to intangible and non-financial assets. Within this paper, these assets are referred to as intellectual capital (IC). In this section we briefly introduce the concepts of intellectual capital and intellectual capital of nations.

The concept of IC refers to strategic (important) intangible resources and can be defined as *all intangible resources that are available to an organization, that give a relative advantage, and which in combination are able to produce future benefits*. Intellectual capital measurement refers to the discipline of identifying, measuring and managing strategic intangible resources. The aim of measuring IC is to gain insight in the strength of the strategic resources in order to be better able to manage these resources.

Intellectual Capital of Nations is the concept that applies the principles of intellectual capital measurement on a macro-economic level. Based on the international developments in this field and our own interpretation of intellectual capital, we would define IC of nations as *all intangible resources available to a country or region, that give relative advantage, and which in combination are able to produce future benefits*. The main motivation for measuring the IC of nations is to get insight into the relative advantage of countries or regions. This insight should help to develop policy in order to give direction to future economic developments. In this paper we apply the concept of IC of nations to the European Union. IC measurements, in order to make sense, should be related to strategic objectives. In this paper we measure the IC of the EU related to the Lisbon agenda on growth and jobs (EU-Council, 2005). In the next paragraph we describe our methodology for measuring the IC of the EU.

3 Methodology

Based on Bontis' (Bontis, 2002; 2004) proposed conceptualization of IC we make a distinction between human capital, structural capital and relational capital. When applied to a macroeconomic level, the above three types of intellectual capital should be interpreted as follows:

- Human capital represents anything related to people: knowledge, education and competencies of individuals in realizing national tasks and goals. Education is the basic building block of human capital.
- Structural capital represents the non-human storehouses of knowledge, which are embedded in its technological, information and communications systems as represented by its hardware, software, databases, laboratories and organizational structures.
- Relational capital represents the intellectual capital embedded in national intra-relationships. It represents a country's capability in providing an attractive, competitive environment.

Based on this taxonomy of three we developed a monitor for the measurement of IC. Within this monitor we added a second layer of classification. Each of the three types of IC is monitored from three different perspectives in order to stress the importance and differences between past, present and future developments:

- Assets (present). This perspective gives an indication of the present power of a nation. It provides an overview of the current main assets.
- Investments (future). This perspective gives insight into the future power of a nation. To maintain or strengthen its present power, organizations should invest in their potential continuously.
- Effects (past). This perspective shows the extent to which the nation has made its intangibles productive during the past period.

The windows and perspectives are combined in a 3 by 3 matrix (Table 1). Implementation of this monitor means filling the fields with appropriate performance indicators. A well-defined Intellectual Capital Monitor consists of a combination of indicators from all three classes and all three perspectives.

Table 1: Intellectual Capital Monitor

	Human capital	Structural capital	Relational capital
Investments			
Assets			
Effects			

Value is in the eye of the beholder. In this paper we measure the value of intellectual capital through the eyes of the Lisbon agenda for growth and jobs (EU-Council, 2005). The calculation of the value of the (different types of) intellectual capital is based on multidimensional value measurement (Pike and Roos, 2000; M'Pherson and Pike, 2001), in which several indicators are combined into one value. In total we used 38 indicators.

Then we identified minimum and target values. As minimum value we used the value of the lowest country. As target value we were only able to identify clear targets for a limited number of variables. For the other variables we used the highest value as the target. We used these minimum and maximum values to normalize all indicators by subtracting the minimum value and dividing it by the total length of the scale. The indicators were combined by using the additive combinatory rule in order to develop 16 separate indicators (Table 2).

Table 2: Combined intellectual capital indicators

	Human capital	Structural capital	Relational capital	Intellectual capital
Investments	HCI	SCI	RCI	ICI
Assets	HCA	SCA	RCA	ICA
Effects	HCE	SCE	RCE	ICE
Total	HC	SC	RC	IC

The previous report focused on 15 countries. Today the EU consists of 27 countries. As it was difficult to find the necessary data for many of the indicators of the new member states, we decided to limit our paper to the so-called EU-19: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, United kingdom. The EU member states that were excluded in this report are Bulgaria, Cyprus, Estonia, Letland, Lithuania, Malta, Romania, Slovenia.

4 Indicators for the renewed Lisbon Strategy

On 23-24 March 2000, the European Council held a special meeting to agree on a new strategic goal for the Union in order to strengthen its knowledge-based economy. The goal was set "to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic

growth with more and better jobs and greater social cohesion" (EP, 2000). In 2005, five years after the launch of the Lisbon Strategy, the European Commission concluded that the results were disappointing (CEC, 2005d). Since 2000, Europe's performance has worsened compared to the US. Although some suggested to abandon the Lisbon ambitions, the Commission argued that the Lisbon challenges were even more urgent in the face of an ageing population and global competition (CEC, 2004, p.6). Therefore, the Commission concurs with the conclusion of the report of the High Level Expert Group chaired by Wim Kok (CEC, 2004) to renew the Lisbon Strategy and focus on "delivering stronger, lasting growth and creating more and better jobs" (CEC, 2005d, p.7). In order to do so, the Commission formulated a renewed Lisbon Action Programme, which consists of four priority areas (CEC, 2005d; EU-Council, 2006) and 15 key policy areas (CEC, 2005b). Improvement in these 15 key policy areas should contribute to the overall objective of stronger, lasting growth and more and better jobs.

Priority area 1. Making Europe a more attractive place to invest and work

This first priority area is divided in five key policy areas: encourage entrepreneurship (SME's); complete the internal market; remove obstacles to competition; reduce administrative costs; and more efficient allocation of capital. The only concrete target in this area is to reduce administrative costs by 25%.

Priority area 2. Knowledge and innovation for growth

This second priority area is divided in five key policy areas: invest more in research and development; stimulate research in biotechnology; increase the use of information and communication technologies; improve transport, energy and telecommunications infrastructure; and encourage innovation. The only concrete target in this area is that by 2010 the EU as a whole should invest 3% of its GDP in R&D.

Priority area 3. Creating more and better jobs

This third priority area is divided in two main policy areas: increase employment rate (more and better jobs); and continuous investment in human capital (lifelong learning). Concrete target in this area is an employment rate (proportion of people aged 15-64 in work) of 70% by 2010 (60% for women and 50% for older workers (55-64)). Other targets for 2010 are: average rate of school leavers of no more than 10%; participation in lifelong learning at least 12.5% of the adult working-age population (25-64 age group); and 85% of 22-year-olds should have completed upper secondary education.

Priority area 4. Moving towards an efficient and integrated energy policy

This fourth priority area is divided in three key policy areas: reduce greenhouse gas emissions and stimulate energy from renewable sources; promote eco-innovation; and stimulate energy efficiency through better technologies. Concrete targets set in this area are a 20% reduction of greenhouse gas emissions compared to 1990 by 2020 and a 20% share of energy from renewable sources in the EU energy mix by 2020.

The overall aim of the 2000-strategy was to become the most competitive knowledge-based economy in the world by 2010. The new Lisbon Strategy is less clear in this respect. "The key aim is getting into a rhythm of high sustainable annual growth and low unemployment by 2010. If, for example, the US does even better that will not mean the EU strategy has failed. Rather, it will be good news for us all. Nevertheless, it is crucial that Europe closes the competitiveness gap with the US" (CEC, 2005b). So, closing the gap with the US is more important than achieving the overall goal by 2010. This means that the growth figures have become relatively more important in assessing the progress of the Lisbon Strategy.

Following the launch of the new Lisbon Strategy in March 2005 the European commission formulated a common strategy (CEC, 2005a), which covers all the actions to be undertaken at Community level, and a set of integrated guidelines for growth and jobs (2005-2008) (CEC, 2005c), which gives direction to the actions to be taken by the member states. These documents provide valuable information for measuring the renewed Lisbon Strategy.

The four priority areas and their key policy areas reflect what the European Commission considers valuable. As the Lisbon Agenda is about the most competitive and dynamic knowledge-based economy this can be used as a proxy for what the European Commission considers valuable intellectual capital in the EU. Closer inspection shows that priority areas one (Making Europe a more attractive place to invest and work) and two (Knowledge and innovation for growth) focus primarily on strengthening the structural capital of the EU, while priority area 3 (Creating more and better jobs) focuses on strengthening the human capital of the EU. Priority area 4 (Moving towards an efficient and integrated energy policy) has no direct relationship with the value of the IC of the EU and we therefore did not use it to construct our IC monitor. What is interesting is that the renewed strategy does not explicitly aim at developing relational capital. We therefore have no indication what the Commission considers valuable in this area. As we think that high quality RC is a necessary precondition for a dynamic and competitive knowledge-based economy, we decided to add an extra priority area: creating sustainable knowledge relationships. This priority area aims at stimulating (international) collaboration between science and business, and stimulating cross funding (public-private) of innovation.

We found 38 indicators that reflect the renewed Lisbon Strategy and our relational capital objective. Data for all indicators were taken from public sources (Eurostat, OECD). We arranged them according to the different types of intellectual capital (HC, SC, RC) and different perspectives (Investments, Assets, Effects). Appendix II provides a complete overview of all indicators. To calculate the correlations we used data from three different years: 1995, 2001 and 2007.

5 Measuring the IC of the EU 2007

In this paragraph we present the findings of the IC Monitor for the EU-19. First we present the total value of the IC of the EU-19 compared to Japan and the USA and the growth figures between 1995 and 2007. Next we provide an overview of the value of the IC of the EU-19 from three different perspectives: investments, assets and effects.

5.1 IC of the EU: total value and growth

The value of the IC of 19 European countries, Japan and the USA is shown in Figure 1. The EU-19 is still behind Japan and far behind the USA, however the EU is catching up as both Japan and the USA have considerably lower growth figures than the EU-19 (Table 3). Between 1995 and 2007 the value of IC in USA grew with 11% and in Japan 18%, while in the EU-19 the average growth figure was 40%. So, despite the lower value of IC, the EU-19 seems to be successful in closing the competitiveness gap with the USA and Japan.

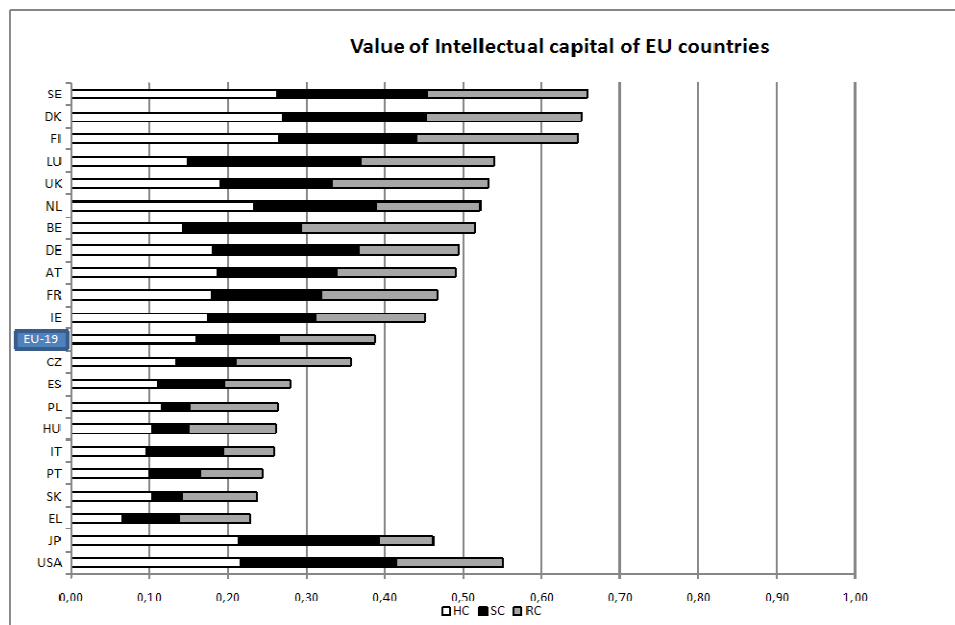


Figure 1: The value of the IC of the EU in 2007 by type of capital

Like the 2004 monitor the results show a strong geographical division. The leading group consists of the Nordic countries above 54 degrees latitude (Denmark, Finland, Sweden). The group of followers consists of Western European countries between 45 – 54 degrees latitude. The laggards are all South European countries (below 45 degrees latitude) and the new European members states (Czech Republic, Poland, Hungary, and Slovak Republic). So, as a result of the enlargement of the EU, we now do not only see a north-south division in the EU, but also an east-west division.

With regard to the value of IC, all new member states perform below average. What is striking is that the Czech Republic is by far the best performing new member state with relatively high scores on human capital (especially human capital assets and effects) and relational capital. A similarity between all new members states is that they score relatively low on SC. They score particularly low on SC assets (especially patents) and SC effects (labour productivity and GDP per capita).

The aim of our paper is to measure the value of the IC of the EU as seen through the eyes of the European Commission. As we have seen, the growth ambition of the Lisbon agenda is closely related to the structural capital of the EU. The best performing countries in terms of structural capital are Luxembourg, Sweden, Germany, Denmark and Finland. The high ranking of Luxembourg is in part the result of its small population and its high scores on labour productivity and GDP per capita. The worst performing countries are Poland, Slovak Republic, and Hungary. The jobs ambition of the Lisbon agenda is closely related to the human capital of the EU. Here the best performing countries are Denmark, Finland, Sweden and the Netherlands. The worst performing countries are Greece, Italy, Portugal, Hungary, Slovak Republic, Spain and Poland.

Table 3: Growth of the value of the IC of the EU between 1995 and 2007

Country	Growth IC 1995 - 2007
USA	11%
JP	18%
EL	18%
SE	19%
BE	22%
UK	22%
AT	25%
DE	26%
DK	26%
IE	29%
CZ	29%
FR	30%
FI	32%
IT	32%
PL	36%
NL	36%
EU-19	40%
LU	47%
ES	50%
PT	51%
SK	54%
HU	56%

With regard to the growth of the value of the IC in the EU between 1995 and 2007, the fastest growers are Hungary and the Slovak Republic, followed by Portugal and Spain. If these growth figures are indicative for future growth it seems quite likely that the relative position of these countries will improve. The slowest growers of the EU-19 are Greece and Sweden. If these figures are indicative for future growth it seems likely that Greece will further weaken its position and that Sweden might fall back to a followers position.

5.2 IC of the EU: investments, assets and effects

In our IC monitor we make a distinction between investments, assets and effects. In this section we provide an overview of the value of the IC of the EU in 2007 from these three perspectives. The measurements are presented in three graphs (Figure 2, 3 and 4).

First, the investments perspective (Figure 2) gives insight in the future power of a nation. What is striking in these measurements is that the Nordic countries have similar patterns with relatively high levels of investments in HC. As continuous investments in IC are a necessary precondition to maintain or strengthen the current position, it might be expected that the Nordic countries will strengthen their top positions. In line with this reasoning, it seems likely that Austria, the first of the followers, will also strengthen its position.

Another striking observation from this perspective is that almost all new member states perform better than the south European countries. In particular Greece stays far behind as a result of a low level of investments in HC. It seems likely that these countries strengthen their positions as laggards.

Compared to Japan and the USA, the EU-19 as a whole invests relatively much in RC. In order to close the competitiveness gap, the EU should invest more in HC (particularly in education) and SC (particularly in R&D and IT).

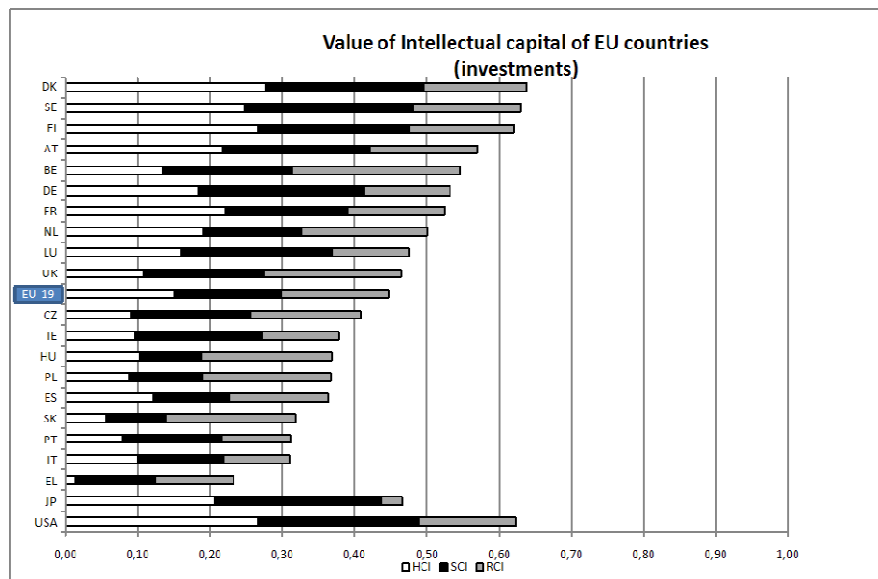


Figure 2: Value of IC investments of the EU-19 in 2007

Second, the assets perspective (Figure 3) is an indicator of the current strength of a nation and provides an overview of the current intellectual capital. Striking is the firm top position of Finland, followed by Denmark and Sweden. Again the Nordic countries hold the three top positions, which is not a surprise as these countries have a long history of high levels of investments in IC (Andriessen and Stam, 2004). From an assets perspective, the relative positions of countries within the EU are not determined by its HC, but by its SC and RC. This supports the idea that SC and RC serves as a multiplier for HC (Edvinsson, 2002). From an assets perspective, the EU-19 is successful in terms of HC (employment), however stays behind in terms of SC (in particular patents and patent applications). Translated to the Lisbon agenda for growth and jobs, the EU-19 is successful in terms of creating more and better jobs, but not successful in terms of delivering stronger, lasting growth.

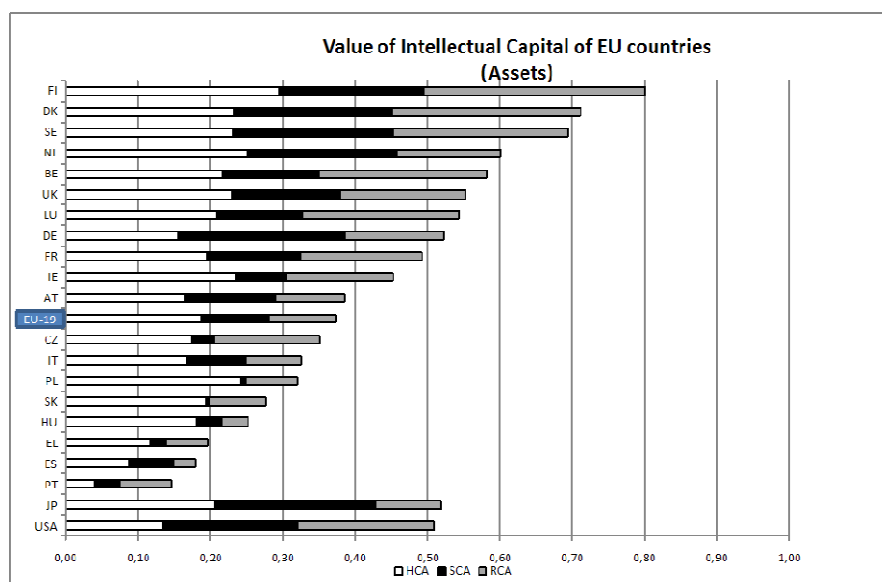


Figure 3: Value of IC assets of the EU-19 in 2007

Third, the effects perspective (Figure 4) is an indicator of the extent to which the nations have made their IC productive. In terms of effects Sweden and Denmark have the highest scores, followed by Luxembourg. The high score of Luxembourg can be explained by its small population and therefore its high score on labour productivity and GDP per capita. The Fins score lower in this category than in other categories because of their average scores on these two indicators, which illustrates that high scores on IC assets (see Figure 3) do not automatically lead to high scores on IC effects.

Labour productivity and GDP per capita are the main reasons why the new member states (Poland, Slovak Republic and Hungary) score relatively low from this perspective. In addition, the Slovak Republic also scores low on RC effects (foreign students and international researchers). The low score of Italy is caused by low scores on HC effects (especially employment rate of female persons) and RC effects (foreign students).

Compared to Japan and the USA, the EU-19 score low on HC. In order to close the gap with Japan and the USA, the EU should improve the employment rate of older workers and women. Compared to the USA, the EU-19 scores low on SC. In order to close this gap, the EU should both increase GDP per capita and labour productivity.

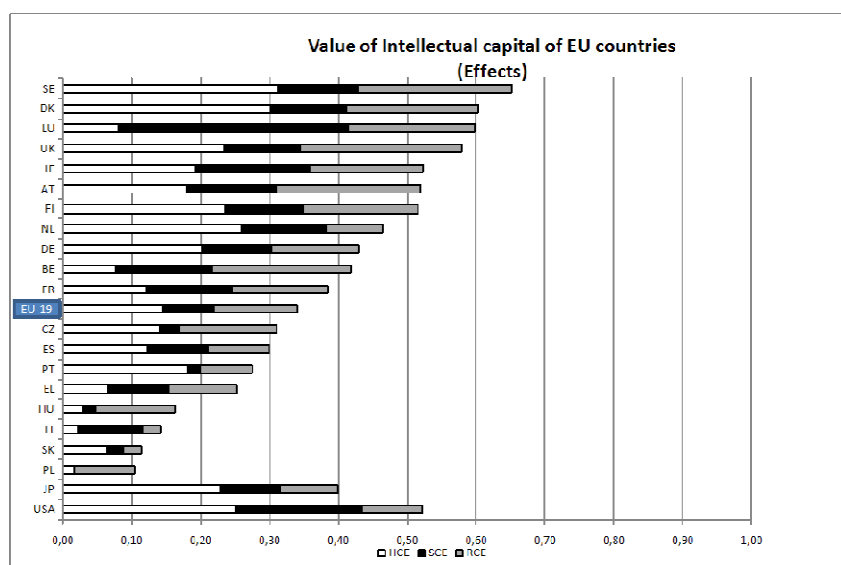


Figure 4: Value of IC effects of the EU-19 in 2007

In the 2004 monitor Andriessen and Stam (2004) concluded that the EU was better in leveraging IC (making IC productive) than Japan and the USA. For 2007 the ratio between assets and effects for the EU-19 is 0.91, for Japan 0.77, and for the USA 1.03. This means that the USA is now better in leveraging IC because one value unit of IC assets leads to 1.03 value unit of IC effects, while in the EU as a whole, one value unit of IC effects leads to 0.91 value unit of IC effects. This changed position is caused by the increase of labor productivity in the USA on the one hand and a weakening of the EU position on the other (mainly as a consequence of the weak positions of the new member states). In order to close the competitiveness gap with the USA, the EU should primarily focus on increasing labor productivity and GDP per capita in the new member states.

6 Testing hypotheses

In the 2004 monitor, Andriessen and Stam (2004) came to three conclusions with regard to the correlations between the different types of IC. First they concluded that “investments in IC pay off”, second they concluded that “high value of IC is no guarantee for high productivity”, and third they concluded that “HC and SC go together”. In this section we test these three hypotheses by using data from three different years: 1995, 2001 and 2007.

The first hypothesis was that “investments in IC pay off” because a strong and significant correlation was found between HCI and HCA, and also between SCI and SCA. So countries that have a high value of IC investments also have a high value of IC assets. In this year’s report we found a similar pattern of relationships. In addition, we also found strong correlations between investments in HC and SC and effects of HC and SC (Figure 5). We did not find similar correlations for RC. Therefore, based on these findings, we think we can further specify this hypothesis: *investments in HC and SC pay off*.

The second hypothesis was that “high value of IC is no guarantee for high productivity”, because it was noticed that high values of IC assets were no guarantee for high values of IC effects. In this year’s report, the correlation between assets and effects is present, but less strong than the correlation between investments and assets and between investments and effects (Figure 5). The correlation between HCA and HCE is ,408, between SCA and SCE is ,413 and between RCA and RCE ,470. These weaker correlations might support the conclusion in the previous report that IC assets are necessary, but not sufficient to make IC productive.

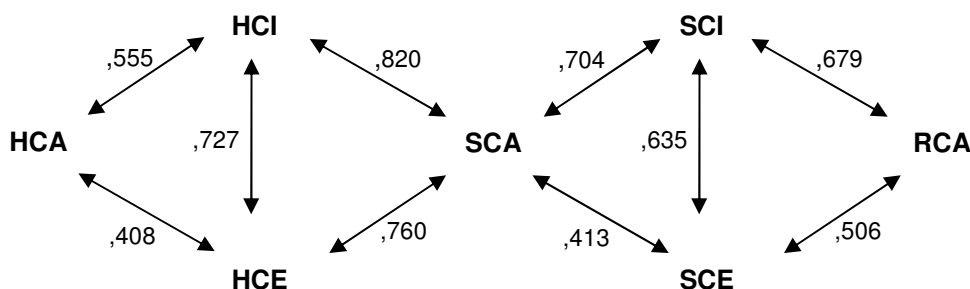


Figure 5: correlations between investments, assets and effects

The third hypothesis was that “HC and SC go together” because leading countries had considerably higher values of both HC and SC and laggards had considerably lower values of both HC and SC. This observation supported the idea that HC and SC are interdependent and mutual enhancing factors. This is what Edvinsson (2002) calls the multiplier effect. In this year’s report we found strong and significant correlations between HC and SC (Figure 5), which could indeed refer to a multiplier effect (SC as a multiplier for HC). To illustrate this multiplier effect we can compare Austria and Italy. Both score around average on human capital assets (,49 vs. ,50). However, Austria scores much higher on structural capital assets (,37 vs. ,24). As a result the human capital effects of Austria are considerably higher (,54 vs. ,06).

In addition, we also found correlations between SC and RC, which could refer to a second multiplier effect (RC as a multiplier for SC). For example, when we compare Ireland to Italy we see that they both score quite low on structural capital assets (,20 vs. ,24). However, Ireland scores twice as high on relational capital assets (,45 vs. ,23). As a result Ireland scores much higher on structural capital effects (,50 vs. ,28). So, in addition to the previous report, it seems as if *SC and RC go together too*.

7 Conclusions

In order to become the most competitive and dynamic knowledge-based economy (compared to Japan and the USA), the EU decided to focus on “delivering stronger, lasting growth and creating more and better jobs” (CEC, 2005d, p.7). Based on our measurements we can conclude that the EU-19 is still behind Japan and far behind the USA, however the EU is catching up as both Japan and the USA have considerably lower growth figures than the EU-19.

From an IC perspective, the EU is geographically divided. An important effect of the recent enlargement of the EU is that we do not only see a north-south division in the EU, but also an east-west division. The Nordic countries are still the best performing countries. The southern European countries and the new member states stay behind. However, as the new member states invest more in their IC, it might be expected that their positions will improve in the future (compared to the south European countries). Of all the new member states the Czech Republic has the best potential.

The aim of our paper was to measure the progress of the Lisbon Agenda for growth and jobs. Based on our measurements we can conclude that the EU-19 is successful in terms of creating more and better jobs, but not successful in terms of delivering stronger, lasting growth. In order to further close the competitiveness gap, the EU should primarily focus on strengthening its SC and RC, in particular increasing labour productivity and GDP per capita in the new member states.

Based on our measurements we were also able to further specify the hypotheses that were formulated in the 2004 monitor. First we found that investments in HC and SC pay off. Second, based on the relative weak (though significant) correlations between IC assets and effects, we concluded that high values of IC assets are no guarantee for high values of IC effects. Finally, we found evidence that HC and SC go together in the sense that they are interrelated. In addition we also found that SC and RC go together. The latter would suggest a second multiplier effect. In order to gain more insight into the causal relationships between the different types of IC as presented in this section and in Figure 5, structural equation modelling is needed.

8 References

- Andriessen, D. G. and Stam, C. D. (2004), *IC of the EU, Measuring the Lisbon Agenda*, Center for Research of Intellectual Capital, Diemen,
- Bontis, N. (2002), "Managing organizational knowledge by diagnosing Intellectual Capital. Framing and advancing the state of the field", in (Eds, Bontis, N. and Choo, C. W.), *The strategic management of Intellectual Capital and organizational knowledge*, Oxford University Press, Oxford, New York, pp.621-642.
- Bontis, N. (2004), "National Intellectual Capital Index: A United Nations Initiative for the Arab Region", *Journal of Intellectual Capital*, Vol.5, No.1, pp.13-39.
- CEC (2004), *Facing the challenge. The Lisbon strategy for growth and employment. Report from the High Level Group chaired by Wim Kok*, Commission of the European Communities, Luxembourg/Brussels,
- CEC (2005a), *Common Actions for Growth and Employment: The Community Lisbon Programme*, Commission of the European Communities, Brussels, COM(2005) 330 final.
- CEC (2005b), "Growth and Jobs website", European Commission, available at: http://ec.europa.eu/growthandjobs/index_en.htm, (accessed 13 May 2008).
- CEC (2005c), *Integrated Guidelines for Growth and Jobs (2005-2008)*, Commission of the European Communities, Brussels, COM(2005) 141 final.

- CEC (2005d), *Working together for growth and jobs. A new start for the Lisbon Strategy*, Commission of the European Communities, Brussels, COM (2005) 24.
- Edvinsson, L. (2002), *Corporate longitude*, Pearson Education, London.
- EP (2000), "Lisbon European Council 23 and 24 March 2000. Presidency conclusions", European Parliament, available at: http://ue.eu.int/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm, (accessed 6 June 2005).
- EU-Council (2005), *European Council Brussels 22 and 23 March 2005. Presidency Conclusions*, Council of the European Union, Brussels, 7619/05.
- EU-Council (2006), *Brussels European Council 23/24 March 2006. Presidency conclusions*, Council of the European Union, Brussels, 7775/1/06.
- M'Pherson, P. K. and Pike, S. (2001), "Accounting, empirical measurement and intellectual capital", *Journal of Intellectual Capital*, Vol.2, No.3, pp.246-260.
- Pike, S. and Roos, G. (2000), "Intellectual Capital Measurement and Holistic Value Approach (HVA)", *Works Institute Journal*, Vol.42.

Appendix I List of abbreviations

List of countries included in this report (EU-19, Japan and USA)

AT	Austria
BE	Belgium
CZ	Czech Republic
DE	Germany
DK	Denmark
EL	Greece
ES	Spain
FI	Finland
FR	France
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
LU	Luxembourg
NL	Netherlands
PL	Poland
PT	Portugal
SE	Sweden
SK	Slovakia
UK	United Kingdom
USA	United States of America

Appendix II IC Monitor 2008

	Human capital	Structural capital	Relational capital
Investments	HCI_1: investment in knowledge HCI_2: expenditure on education per student HCI_3: expenditure on education as percentage of GDP HCI_4: participation in life-long learning HCI_5: adult training	SCI_1: Gross domestic expenditure on R&D SCI_2: public investment in R&D SCI_3: private investment in R&D SCI_5: SME's innovating in house SCI_6: ICT expenditures SCI_7: SME's using organizational innovation SCI_8: non-technological innovation	RCI_1: government financed business R&D RCI_2: foreign funding of R&D RCI_3: foreign business investments RCI_4: Business-funded R&D in the higher education and government sectors RCI_5: private investment in education
Assets	HCA_1: youth educational attainment (20-24) HCA_2: population with tertiary education HCA_3: occupations and skills in the information economy HCA_4: PISA scores HCA_6: drop outs	SCA_1: Broadband penetration SCA_3: scientific publications SCA_4: patent applications SCA_5: patents in environment-related technologies	RCA_1: Innovative SME's co-operating with others RCA_2: collaboration with public research organizations by innovating firms RCA_3: international collaboration in science RCA_4: foreign collaboration on innovation
Effects	HCE_2: employment rate HCE_3: employment rate of older workers HCE_4: employment rate of women	HCE_1: GDP per capita SCE_1: Labour productivity	RCE_1: number of foreign students RCE_3: number of international researchers RCE_5: % patents with foreign co-inventors