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MEASURING THE INTANGIBLES USING SURVEY DATA

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<i>(This report is subject to change if during the project other surveys in other countries (not related to Globalinto) are done. In that case they will be included, and this deliverable will change.)</i>		



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Summary

Corrado et al. (2006) proposed a now widely accepted definition of intangible capital which comprises three broader categories, which are: (1) computerized information, (2) innovative property and (3) economic competencies. While the definition of the intangible capital is now accepted, the measurement of intangible capital represents still a significant challenge to statisticians and economists at large. Generally, registry or survey sources can be used.

Several projects, such as INTAN, COINVEST, INNODRIVE; SPINTAN have attempted developing suitable **registry-based methodologies**, which led to a number of empirical studies, focusing on the size of intangible investments, cross-country differences and linkages to productivity and other performance indicators

Besides the registry data **survey approach** is another option to measure intangible capital. The purpose of this paper is:

- 1) to investigate and evaluate the existing approaches to measuring intangible investments using survey data (Italian and UK Intangibles survey, Eurobarometer survey and Western Balkan survey) (summary in Table S1)
- 2) the existing survey data, collected by national statistical offices under the umbrella of Eurostat in order to propose a method for capturing intangible investment in the EU relying on existing data-set or by extending existing methodologies for data collection marginally and thereby incorporate also intangible investment component (summary of just main findings and recommendations in Table S2).

Both summary tables (Table S1 and Table S2) are provided on the next two pages.

Table S 1: A summary overview of existing surveys

Survey Characteristic	Eurobarometer (2013)	UK Investment in Intangible Assets Survey	Italian	Prašnikar et al.
Addressing core components	Very brief, no details covered <ul style="list-style-type: none"> – Training – Software development – Company reputation and branding – R&D – Design of products and services (excluding R&D) – Organization and business process improvement 	Core components covered: <ul style="list-style-type: none"> – Employer funded training – Software – Reputation and branding – R&D – Design – Organization or business process improvement 	Core components covered (same as UK): <ul style="list-style-type: none"> – Employer funded training – Software – Reputation and branding – R&D – Design – Organization or business process improvement 	All standard components covered: <ul style="list-style-type: none"> - Computerized information - Innovative capital - Economic competencies Questionnaire divided into more sections (HRM and organization, branding and brand management)
Additional components	Company motivation Drivers and barriers Examination of internal and external sources invested into IC Ownership and M&A Expected duration of benefits	No additional components covered	Mineral exploration added Effect of the crisis on intangibles and mitigation of the crisis effect	<ul style="list-style-type: none"> – Informational capital – Social capital – Relational capital – Eco-capital Abundant additional information on motivation, strategy, barriers, etc.
Target group: size and industry	Companies with at least 1 employee Manufacturing (NACE C), Services (NACE G/H/I/J/K/L/M/N/R) and Industry (NACE D/E/F)	Companies with 10 or more employees Production and service companies: B to N of the Standard Industry Classification (SIC) 2007		Manufacturing (and service sector only in Slovenia) Medium and large companies (50+ employees or 100+ in Slovenia) Computer assisted personal interviews Random sample from target group (50/100+)
Country coverage	27 EU countries and also in Croatia, Iceland, Japan, Norway, Republic of Serbia, Switzerland, Turkey, the Former Yugoslav Republic of Macedonia and the United States	UK (2009 and 2010)	Italy	Slovenia, BiH, Albania
Structure	8 general questions about company 10 questions with sub-questions on intangibles	29 questions, 26 about intangibles, 3 general, each section (B-F) comprising 4 questions (B had 5)	46 questions in sections A-F	Seven subsections with total close to 50 questions with sub-questions
Method	Majority of questions with predefined value brackets Likert scale Yes/No One question with specific values to be inserted Simple random sample CATI	Each section had a filter Yes/No question Three more questions requiring specific value (euros, duration in years & months)	Each section had a filter Yes/No question Three more questions requiring specific value (euros, duration in years & months) Additional comments invited each time	Cascading approach of Y/N building into 1 to 4 values Questions with predefined value brackets Likert scale Yes/No Questions with specific values to be inserted
Overall comment	Very short, clear, easy to fill in Different scales Lack of content with regards to understanding intangibles as well as insufficient data about the size of IC investment	Short & simple Lack of detail Lack of additional insights into motivations, expected benefits, etc. Poorly defined specification of expenditures, that comprise certain type, possibly lowering data quality	Short & simple Lack of detail Lack of additional insights into motivations, expected benefits, etc. Poorly defined specification of expenditures, that comprise certain type, possibly lowering data quality	<ul style="list-style-type: none"> - Lots of details, allowing causal analysis - Importance of cascading approach - Clear and easy statements, reliability of data

Table S 2: Possible use of existing Eurostat (survey) data

	Database / Survey	Problems	Recommendation
Computerized information	ICT usage in enterprises Structural business statistics data	<ul style="list-style-type: none"> - Comparability - Complete lack of information on expenditure value or only multiannual availability for some sectors - Changing survey structure - Lack of data on depreciation rates 	<ul style="list-style-type: none"> - Extending ICT questionnaire with questions on expenditure values of purchased software and databases, and internal expenditure - Adding 2 questions on depreciation period (software, databases)
Innovative property	Community Innovation Survey	<ul style="list-style-type: none"> - Lack of data on depreciation rates - Categories for which data is collected not aligned best with Corrado <i>et al.</i> (2006) definition 	<ul style="list-style-type: none"> - Harmonizing at the level of EU the intangible investment categories and extending existing surveys (CIS included) to fit the new definition while at the same time maintaining the existing categories - Adding questions on depreciation period (for each innovative property type)
Economic competencies	Community Innovation Survey Continuous Vocational Training Survey	<ul style="list-style-type: none"> - Lack of data on expenditure - Lack of data on depreciation rates 	<ul style="list-style-type: none"> - Adding organizational innovation expenditure (more clearly as a separate category) in CIS - Clearly separating brand investment in CIS and also dividing costs into external and internal

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MEASURING THE INTANGIBLE INVESTMENT USING SURVEY DATA

Tjaša REDEK, Mojca BAVDAŽ¹

1 Introduction

Corrado *et al.* (2006) extend the standard definition of investment from tangible to also include intangible sources by claiming that the use of resources which is characterised by refraining from current consumption in order to increase future consumption is in fact an investment. This focus on refraining today to consume more tomorrow represents the critical element of the definition of investments. Based on this approach, investments can be classified into standard – tangible and intangible investments. Corrado *et al.* (2006) propose their definition of intangible capital following the works of Lev (2001) and Nakamura (1999) claiming that intangible capital comprises three broader categories, which are: (1) computerized information, (2) innovative property, and (3) economic competencies. While the initial estimates of Lev (2001) showed intangible investment, at the time limited to R&D and advertising expenditure costs, were between 5.5 and 7 % of non-financial corporations' GDP, the recent estimates, based on the definition by Corrado *et al.* (2006) show that the aggregate intangible investments are between 6 and 13 % of GDP, depending on country and year (Corrado, Haskel, Jona-Lasinio, & Iommi, 2012, 2016; van Ark, Hao, Corrado, & Hulten, 2009).

As Corrado *et al.* (n.d.) highlight, while the definition of the intangible capital is now accepted, the measurement of intangible capital still represents a significant challenge to statisticians and economists at large. Generally, as also Corrado *et al.* (n.d.) stress, the empirical understanding of intangible capital continues to be weaker than desired. Several projects, such as INTAN, COINVEST, INNODRIVE, and SPINTAN have attempted developing suitable register-based methodologies, which led to a number of empirical studies, focusing on the size of intangible investments, cross-country differences and linkages to productivity and other performance indicators (Chun, Miyagawa, Pyo, & Tonogi, 2016; C. Corrado, Haskel, & Jona-Lasinio, 2016, 2017; C. Corrado, Haskel, Jona-Lasinio, & Iommi, 2013; Carol Corrado *et al.*, 2012; Carol Corrado, Hulten, & Sichel, 2009; de Rassenfosse, 2017; Fukao, Miyagawa, Mukai, Shinoda, & Tonogi, 2009; Hashmi, 2013; H. Piekkola, 2018a, 2018b). At the same time, methodological challenges were addressed (e.g. (Hannu Piekkola, 2016)). As Corrado *et al.* (n.d.) stress, the main criteria for methodological development were: exhaustiveness, reproducibility, comparability across countries and time, and consistency with the national accounts definitions.

¹ Both authors are affiliated with the University of Ljubljana, Faculty of Economics and Business. This work forms part of the H2020 Globalinto project, with the full title: »Capturing the value of intangible assets in micro data to promote the EU's growth and competitiveness«.

Besides the registry data **survey approach is another option to measure intangible capital**. The purpose of this paper is to investigate the existing approaches to measuring intangible investments using survey data and the available survey data sources in order to propose a method for capturing intangible investment in the EU relying on existing data-set. By doing so, the paper also highlights the downsides of relying on existing survey data, which later serves as input to proposing a new survey approach.

In addition, we also investigate the option to rely on existing national and Eurostat surveys to capture components of intangible capital. When discussing the appropriateness of a data source for measurement of intangible capital or any other component, several issues must be addressed according to Canibano *et al.* (1999):

- 1) Core components of intangible capital must be identified. Here we primarily address the Corrado *et al.* (2006) definition, although some other definitions will be mentioned as well.
- 2) The robustness of the definitions and the measurements must be addressed.
- 3) The origin of the data must be checked, focusing on existing frameworks and new measures.

In this paper we focus on intangibles, but largely follow a very similar approach. Despite the general agreement on the definition of intangible capital, there are still several open conceptual issues, which we address:

- 1) The differences in the definition of intangible capital in the private and public sector.
- 2) The (continuous) appropriateness of the existing definition of the intangible capital and intangible investment.
- 3) The measurement of intangible capital and investment using different data sources and different data types, either survey data or different register data.

In continuing, first the existing approaches to measuring intangible capital are being discussed, both in relation to the proposed definition of intangible capital as well as the methodological characteristics of each of them and differences between the approaches. While the existing surveys add a great value to the intangible investment study, they are nonetheless focused on a specific period and country, while a pan-European survey does not yet exist. Therefore, in continuing we attempt to propose a methodology for capturing intangible investment using existing Eurostat data. While surveys are not adjusted at the moment for measuring intangible investment and intervals are not the same, the data is nonetheless already being collected and the efforts to create an intangibles database would be significantly smaller. At the end, data are presented to highlight the differences between the countries, relying on existing data.

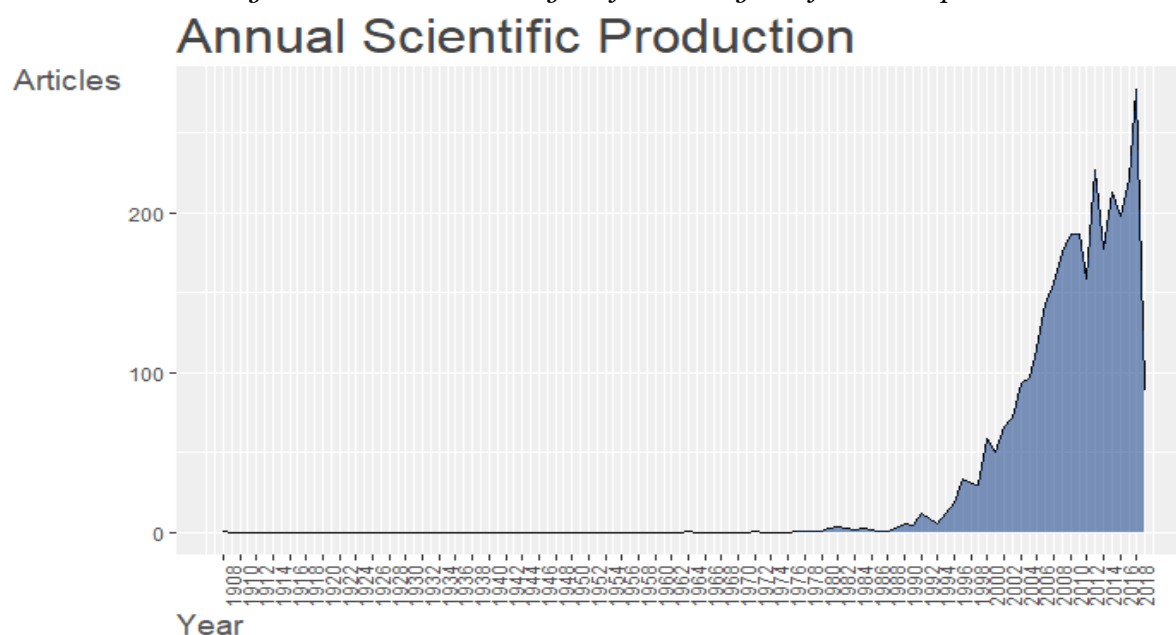
2 The definition of intangible capital

In modern business practise, capital is distinguished into two co-ordinate categories of assets, tangible and intangible (Veblen, 1908):

“Tangible assets” is here taken to designate pecuniarily serviceable capital goods, considered as a valuable possession yielding an income to their owner. Such goods, material items of wealth, are “assets” to the amount of their capitalizable value, which may be more or less closely related to their industrial serviceability as productive goods. “Intangible assets” are immaterial items of wealth, immaterial facts owned, valued, and capitalized on an appraisalment of the gain to be derived from their possession.”

The concept of intangible capital is an old concept, in fact the bibliographic research (Figure 1) shows that the concept is now over 100 years old and was used by Veblen in the same context as it is researched today.

Figure 1: Bibliometric analysis of the intangibles field in Scopus



Source: Bibliometric analysis of Scopus data.

The concept developed gradually and was used on many streams of economic and business research, focusing on brands and their strategic value, education, R&D, strategy, patents, etc., linking them to profitability (Chudnovsky, 1979; Eisner, Simons, Pieper, & Bender, 1982; Griliches, 1981; Hirschey, 1982; McMahon, 1984; Reekie & Bhoyrub, 1981; Swales, 1985), discussing the system of national accounts (“The system of national accounts: Review of major issues and proposals for future work (part I),” 1984) and other. But the link of intangibles to productivity emerged in the economic literature in relation to productivity more strongly in 1960s and 1970s, when the first papers focusing on intangible

capital, investment or knowledge capital in the sense, which is relevant for this research, emerged more systematically (Connor, 1964)².

In particular a paper by Kendrick (1972) was published in this period and was later cited by a number of papers. Kendrick addressed the measurement of capital stock and investments, both tangible and intangible, between 1929 and 1966. Primarily, the authors showed that the investment as a share of GDP increased and claimed that all this “increase occurs in the intangible component comprising R & D, education and training, health, and mobility” (Kendrick, 1972). By doing so, Kendrick clearly introduced the idea of intangible capital into the literature and it is also (besides Connor, 1964) the first paper in Scopus that speaks directly of “intangible investment” in the same sense as used in this project.

Ducharme (1998) stressed that it was empirical work by Kendrick (1956, 1976), Denison (1962, 1967), Jorgenson and Griliches (1967) and also by some others, that first stressed how a significant share of productivity growth cannot be explained by standard productivity growth elements (capital and labour), but other factors, such as education, skills, R&D, and also even health or what Ducharme (1998) stressed as acquisition and transmission of know-how.

The intangible capital literature continued to develop steadily also in the 1980s and 1990s, when for example authors studied further the relationships between advertising, internationalization, market entry, firm valuation, goodwill, market strategy, firm competencies, firm performance and profitability (Barrett, 1986; Barwise, Higson, Likierman, & Marsh, 1990; Budworth, 1989; Chauvin & Hirschey, 1994; Harvey & Lusch, 1997; Hirschey, 1982; Hula, 1989; Kumar, 1987; Lefebvre, Lefebvre, & Harvey, 1996; Patterson & Hayenga, 1995; Philippe, 1995; Vasapollo, 1994). This literature develops fragments (more or less complete) of the definition of intangible assets as is prevailing today.

But the systematic study of the methodological approach to capturing intangible assets and investment and the study of the link between intangible assets and investment to productivity was most profoundly marked by the seminal work of Corrado et al. (2006), which divide the intangible capital into three types: computerized information, innovative property and economic competencies (Table 1).

Table 1: Intangible assets classification

Type of intangible asset	Further classification
Computerized information	Software
	Databases
Innovative property	R&D, including social sciences and humanities
	Mineral exploration and evaluation
	Copyright and license cost
	Development costs in financial industry
	New architectural and engineering designs
Economic competencies	Brand equity (advertising expenditure, market research)
	Firm specific human capital (continuing vocat. training, apprentice training)
	Organizational structure (purchased, own account)

Source: Corrado et al., 2006.

² Connor in 1964 discussed the need to use best electronic parts in order to ensure high-quality and top performance. Although this might be related to higher cost, reliability will justify the cost. The author discussed the problems of evaluating the impact of this reliability and mentions in this context intangible investment.

The categories are further divided into several subcategories. Computerized information is divided into software and databases. Innovative property is further divided into 5 sub-categories, ranging from R&D to design, while economic competencies are divided into brand equity, firm specific human capital and organizational structure.

This definition is still the prevalent definition of intangible investment, although some extensions have been made and are being discussed further also within this project. For example, the survey on intangible capital in the Balkan region (Prašnikar, 2010; Prašnikar & Knežević Cvelbar, 2012; Prašnikar, Redek, & Memaj, 2012) extended the existing Corrado et al. (2006) definition by adding four other components: relational capital, informational capital, social capital of the firm and eco-capital. Due to the continuous development of the definition of “assets” and the changes in the socio-economic development, this project also foresees further extensions or redefinitions of existing categories, to incorporate the relevant aspects of new technologies (Industry 4.0.), population structure (in particular with relation to ageing), market power of firms, and firm size and global value chains position (see (Redek et al., 2019)).

3 Measuring intangible capital using survey data: overview of past work

While the concept of intangible capital is not new in the literature, measurement of different components of intangible capital remains a challenge, both for the lack of appropriate data sources as well as for the lack of generally accepted definitions.

Regarding data sources, studies mostly rely on two types of data: register-based and survey-based. This report focuses on the latter. There have not been many survey-based approaches to measuring intangible capital that have been highly cited in the literature. Primarily, the following surveys have made a more pronounced mark or have been used in more than one country:

- 1) NESTA & ONS (2009; 2010): Investment in Intangible Assets Survey (UK).
- 2) Eurobarometer survey (2013): “Investing in Intangibles: Economic Assets and Innovation Drivers for Growth” (EU-27, Croatia, Iceland, Japan, Norway, Serbia, Switzerland, Turkey, the Former Yugoslav Republic of Macedonia and the United States).
- 3) ISFOL & ISTAT (2013): “Rilevazione statistica sugli investimenti intangibili (*in English*: Statistical survey of intangible investment)” (Italy)
- 4) Prašnikar et al. (2010-2015) survey of intangible capital in the private and public sector

In continuing we address the surveys from the perspective of the characteristics, stressed by Canibano et al. (1999):

- 1) Core components of intangible capital must be identified;
- 2) The robustness of the definitions and the measurements must be addressed;
- 3) The origin of the data must be checked, focusing on existing frameworks and new measures.

Table 2 briefly summarizes all surveys. The table is discussed in Chapter 3.5 (comparative analysis).

Table 2: Core components of intangible capital in existing surveys

Survey Characteristic	Eurobarometer (2013)	UK Investment in Intangible Assets Survey	Italian	Prašnikar et al.
Addressing core components	Very brief, no details covered <ul style="list-style-type: none"> – Training – Software development – Company reputation and branding – R&D – Design of products and services (excluding R&D) – Organization and business process improvement 	Core components covered: <ul style="list-style-type: none"> – Employer funded training – Software – Reputation and branding – R&D – Design – Organization or business process improvement 	Core components covered (same as UK): <ul style="list-style-type: none"> – Employer funded training – Software – Reputation and branding – R&D – Design – Organization or business process improvement 	All standard components covered: <ul style="list-style-type: none"> - Computerized information - Innovative capital - Economic competencies Questionnaire divided into more sections (HRM and organization, branding and brand management)
Additional components	Company motivation Drivers and barriers Examination of internal and external sources invested into IC Ownership and M&A Expected duration of benefits	No additional components covered	Mineral exploration added Effect of the crisis on intangibles and mitigation of the crisis effect	<ul style="list-style-type: none"> – Informational capital – Social capital – Relational capital – Eco-capital Abundant additional information on motivation, strategy, barriers, etc.
Target group: size and industry	Companies with at least 1 employee Manufacturing (NACE C), Services (NACE G/H/I/J/K/L/M/N/R) and Industry (NACE D/E/F)	Companies with 10 or more employees Production and service companies: B to N of the Standard Industry Classification (SIC) 2007		Manufacturing (and service sector only in Slovenia) Medium and large companies (50+ employees or 100+ in Slovenia) Computer assisted personal interviews Random sample from target group (50/100+)
Country coverage	27 EU countries and also in Croatia, Iceland, Japan, Norway, Republic of Serbia, Switzerland, Turkey, the Former Yugoslav Republic of Macedonia and the United States	UK (2009 and 2010)	Italy	Slovenia, BiH, Albania
Structure	8 general questions about company 10 questions with sub-questions on intangibles	29 questions, 26 about intangibles, 3 general, each section (B-F) comprising 4 questions (B had 5)	46 questions in sections A-F	Seven subsections with total close to 50 questions with sub-questions
Method	Majority of questions with predefined value brackets Likert scale Yes/No One question with specific values to be inserted Simple random sample CATI	Each section had a filter Yes/No question Three more questions requiring specific value (euros, duration in years & months)	Each section had a filter Yes/No question Three more questions requiring specific value (euros, duration in years & months) Additional comments invited each time	Cascading approach of Y/N building into 1 to 4 values Questions with predefined value brackets Likert scale Yes/No Questions with specific values to be inserted
Overall comment	Very short, clear, easy to fill in Different scales Lack of content with regards to understanding intangibles as well as insufficient data about the size of IC investment	Short & simple Lack of detail Lack of additional insights into motivations, expected benefits, etc. Poorly defined specification of expenditures, that comprise certain type, possibly lowering data quality	Short & simple Lack of detail Lack of additional insights into motivations, expected benefits, etc. Poorly defined specification of expenditures, that comprise certain type, possibly lowering data quality	<ul style="list-style-type: none"> - Lots of details, allowing causal analysis - Importance of cascading approach - Clear and easy statements, reliability of data

3.1 The UK Intangibles Programme and “Investment in Intangible Assets” Survey

The Office for National Statistics and Imperial College London (within COINVEST project) developed a survey, also known as the UK Investment in Intangible Assets Survey (IIA Survey). The UK Investment in intangible assets is part of the “Innovation Index”, prepared by NESTA/Imperial College) in order to provide an alternative approach to at that time prevailing macro-work (E. Haskel, Awano, Franklin, & Kastrinaki, 2010). The survey targeted companies from production and service sectors, but focusing on those with 10 or more employees. The survey was conducted using post. The data and questionnaires are today available to researchers at the UK Data Service (Office for National Statistics & Imperial College London, 2016)..

The purpose was to measure more in detail primarily the following aspects (ONS, 2009):

- Employer funded training
- Software
- Reputation and branding
- R&D
- Design
- Organization and business process improvement

The survey was conducted twice: in 2009 and 2010 explored the level of spending and life lengths investment into intangible assets. According to Haskel et al. (2010) the survey was characterized by three innovative elements:

- 1) Despite the fact that the survey covers also innovation, the survey is broader than just innovation due to its focus on intangibles,
- 2) The survey focuses also on the purchased intangibles, therefore it includes both those developed within the firms as well as those purchased.
- 3) The survey also attempted to estimate depreciation rates by accounting for the expected duration of benefits from an intangible asset (Office for National Statistics & Imperial College London, 2016).

3.1.1 Questionnaire structure by topic

The questionnaire comprised in total 29 questions, divided into sections A to H. In continuing we briefly summarize the sections. We summarize the questionnaire provided at the UK data service (Office for National Statistics & Imperial College London, 2016).

Section A only examined the reporting period, namely asking the period for which the firm is filling in the information.

Section B was devoted to employer funded training. The questionnaire in this part examined several aspects:

- Whether the company funded any training of employees;
- What the expenditure on training was for external providers
- What the spending was on those, who provided training within the organization;
- How many days of training on average each staff member received;
- How long the firm expected benefit from training

Section C examined software, again focusing on several aspects:

- Whether the firm purchased or developed any software;
- What the business expenditure on software from external providers was;
- What the spending was on those, who developed software within the organization;
- How long the firm expected benefit from this software

Section D examined reputation and branding, where the following elements were examined:

- First, the questionnaire studied whether the company funded any internal or external work intended to strengthen reputation and brand value of either firm as a whole or specific part;
- What the business expenditure on such activities from external providers was;
- What the spending was on those, who conducted reputation and brand enhancing activities within the organization;
- How long the firm expected benefit from these reputation and brand enhancing activities

Section E was devoted to research and development. The questions were very similar to those related to other topics:

- First, the questionnaire studied whether the company funded any internal or external R&D
- What the business expenditure on R&D activities from external providers was;
- What the spending was on those, who conducted R&D activities within the organization;
- How long the firm expected benefit from typical R&D investment

Section F covered design, where again the same structure of questions was used:

- First, the questionnaire studied whether the company funded any internal or external design
- What the business expenditure on design activities from external providers was;
- What the spending was on those, who conducted R&D within the organization;
- How long the firm expected benefit from typical design investment

Section G covered Organization or Business process improvement, again the same structure was used:

- First, the questionnaire studied whether the company funded any internal or external work on Organization or Business process improvement
- What the business expenditure on Organization or Business process improvement activities from external providers was;
- What the spending was on those, who conducted Organization or Business process improvement within the organization;

- How long the firm expected benefit from typical Organization or Business process improvement investment

At the end (section H) the questionnaire requested also any additional relevant information.

3.1.2 *Methods*

The questionnaire used in the UK Survey on investment in intangible assets represents an innovative approach in trying to measure the intangible investments at a micro level using a survey. Overall, the questionnaire comprises 29 questions, which are very short and clear. An additional simplification for the respondent is the repeated content of questions, as the questionnaire always addresses 4 key issues:

- Whether a type of investment was made;
- Spending on external sources providing a certain type of asset;
- Spending on internal sources;
- Expected duration of benefits.

The questionnaire uses two types of questions:

- Simple Yes/No question in each section to filter out the firms that did not invest in a certain type;
- Questions asking for a numerical answer, specific information (value of expenditure and duration of benefits)

This further simplifies the work for the respondent, as the questions in fact only refer to different categories, but are otherwise the same.

But simplicity also carries a certain amount of disadvantage. First, only overall values on specific intangible investment type are being collected, while any details on sub-categories are not revealed. Second, the related interesting and very relevant business aspects like motivations, expected benefits, causes of benefits, linkages between type of intangibles and specific benefits, also risks, etc. are left aside. Consequently any deeper analysis, one that goes beyond the numerical estimation also possible at macro level, remains impossible. In addition, despite the fact that for each category of expenditure a definition is provided, a lot remains at the discretion of the company. For example, for the “business expenditure on organization and business process improvement” the instructions say that the company should “include the bought-in management consultancy services”. This is a very broad definition, which allows a significant amount of freedom to the respondent, possibly introducing significant bias.

3.2 Eurobarometer survey on intangible assets

Eurobarometer study “Investing in intangibles: Economic assets and innovation drivers for growth” was conducted in 2013 at the request of DG in order to investigate the corporate investment in intangible assets as they were recognized by the European Commission as being increasingly important in the process of economic growth of the developed countries, but their impact was difficult to measure (Eurobarometer, 2013).

The survey was conducted in 2013 in 27 EU countries and also in Croatia, Iceland, Japan, Norway, Republic of Serbia, Switzerland, Turkey, the Former Yugoslav Republic of Macedonia and the United States. Sampling was simple random sampling and the survey was done using CATI approach (GESIS - Leibniz-Institut für Sozialwissenschaften, 2014). The target group were companies with at least one employee in the following industries (Eurobarometer, 2013):

- Manufacturing (NACE C),
- Services (NACE G/H/I/J/K/L/M/N/R) and
- Industry (NACE D/E/F)

More specifically the survey was designed to investigate (Eurobarometer, 2013):

- The types of intangible capital companies have (or invest in)
- The use of internal or external resources (finance) when investing in intangible assets
- The reasons (rationale) for investing in intangible assets,
- Barriers to investment in intangible assets
- The perceived benefits from investing in intangible assets and
- the perceived duration of benefit from investing in intangible assets
- The links between innovation projects and investment in intangible assets

3.2.1 Questionnaire structure by topic

The questionnaire was relatively short and very straightforward. The section on intangible investment in total comprised five questions, which covered the following topics (Eurobarometer, 2013):

- The priorities of the company, where the following were addressed (Eurobarometer, 2013):
 - rapid development of new products and services
 - Tailored and customized solutions
 - Ensuring lower prices
 - Increasing labour productivity
 - Decreasing production costs
 - Other options could be specified by companies
- The size of the investment in intangible assets as % of turnover (where percentage brackets were provided, following from 0 to more than 50%, divided into total of 7 sub-classes for each of the categories, with data on both internal resources provided as well as amount invested as % of turnover by relying on external provision (Eurobarometer, 2013):

- Training
- Software development
- Company reputation and branding
- R&D
- Design of products and services (excluding R&D)
- Organization and business process improvement

The questionnaire also investigated the expected duration of the benefits reaped from investing into each of the aforementioned categories of intangible capital. Companies could choose between 4 different time spans ranging from less than 2 years to more than 10 years (Eurobarometer, 2013).

At the end of the section, the survey also addressed whether R&D, software development and other categories (training, design, reputation, branding, etc.) were reported in the company as intangible assets (Eurobarometer, 2013).

In continuing, the survey addressed the motivation of companies for investing into intangible assets. A number of reasons were listed, including (Eurobarometer, 2013):

- Improvement of internal skills on intangible assets
- Quicker development of products and services
- Higher economic returns and larger market shares
- Greater efficiency
- Public supports (financial stimulus)
- Regulatory changes

The reasons not to invest were also investigated, where companies again could select among several:

- Accounting rules being too difficult
- Cost of investment
- Limited information and expertise in the external environment
- Tax treatment of intangibles
- Lack of public financial supports
- Regulatory framework

At the end, the company was also asked to evaluate the impact of intangibles on:

- Standard performance indicators (such as sales, market share, etc.)
- Innovation output (product, process and organizational)
- Innovation projects

The section on the general characteristics of the company “Socio-economic questions” contained in total 8 questions. The questions focused on:

- Year of establishment
- The location of the company

- Whether the company is part of a wider group;
- Possible mergers and acquisitions within the past 2 years;
- Turnover size, trends
- Geographical distribution of sales
- Number of employees

3.2.2 *Methods*

The questionnaire is very short with 18 questions with sub-categories in total. The questions are very straightforward and easy to understand, therefore, there is little expected problem with biases introduced due to the misunderstanding or poor understanding of questions.

Short and simple statements also imply that questionnaires can be finished quickly, consequently, the drop-out is low.

Most questions have pre-prepared scales, including those, which are specifying the size of the investments into intangible capital. For example, “what percentage of turnover do you invest into training...”. The possible answers are pre-defined with 0%, less than 1%, 1-5%, 5-15%, 15-25%, 25-50%, more than 50%. This is a very clear specification and also allows the companies to easily answer the question without the need to engage in time-consuming detailed search for data. But at the same time, these brackets are problematic for several reasons:

- Very few companies invest more than 10% of turnover into a specific activity, let alone 50%. Therefore, the brackets should be based on the distribution of the expenditure (past researches). Here, as also the results show (Eurobarometer, 2013) that roughly 75% of companies remained below 5%, meaning that the distribution was highly skewed to the right. As Eurostat data show, for example for R&D the majority of companies are well below 3% (Eurostat, 2019d). Therefore, it is highly unexpected that many companies would be above 50%. A different scale would allow a more realistic capture of values.
- A different scale and a more realistic set of values would also allow better analysis and more insights into the actual size of intangible investment. The difference between 5 and 15% of turnover is very high, yet, the companies are in the same “bracket”. The difference within the bracket is a result of very different motivations and also the results differ significantly.
- The brackets are the same for different investment types. While this simplifies the questionnaire, it is much more difficult to capture the nature and the logical differences in the size of different investment into different intangible assets.
- The questionnaire also due to its shortness lacks depth. While its condensed approach ensures time-efficiency, from analytical perspective it offers little detail that would allow analytical depth, focusing on causal relations. In addition, the nature of the scales (Likert type) and the aforementioned width of the pre-defined percentages in the answers limits the analytical potential of the data.

3.3 ISFOL and ISTAT survey on intangible assets

A survey on intangible assets was carried out also in Italy, in the cooperation between ISFOL (National Institute for the Analysis of the Public Policies), and ISTAT (the National Statistical Institute) (Angotti, 2017). The purpose was to capture the nature of intangible investment in Italian companies, based on the experience in the UK. The survey focused on companies with 10 or more employees and in total collected 10 thousand responses (Angotti, 2017).

3.3.1 Questionnaire structure by topic

The questionnaire comprised in total 46 questions, divided into sections A to H.

Section A was devoted to training. First, the company was asked to state whether they provided any training for its employees in 2012 and whether they provided internal courses, external courses and any other training activities. Spending on internally provided and externally provided training was asked for next, and in addition the company was also asked to provide information on the acquisition of immovables or other capital assets needed for training. The number of participants and average number of hours per participant was requested, followed by the information on the expected duration of benefits. Comments were invited.

Section B was devoted to software. First, companies were asked whether the company acquired or developed software packages or databases and whether it did so using internal or external sources. Spending on both types of development was asked for next, followed by the expected duration of benefits.

Section C was devoted to investments in image, corporate reputation and brands. First, companies were asked whether they invested into improving own corporate image and reputation and next, whether they employed internal or external sources. Costs for each of those two types were asked to be evaluated and expected duration of benefits. The survey also asked whether companies offered marketing or market research activities to other companies and additional comments were invited.

Section D was investigating R&D. First, companies were asked to report whether they carried out internal or external R&D. Then, they were asked to report the spending on internal and external R&D, where (in contrast to the UK survey the structure of eligible costs was reported in detail). For internal R&D, the survey also asked that the respondents specify what percentage of R&D was developed for internal use and what for others. Again, the expected duration of benefits from R&D was asked for. Comments were also invited.

Section E was devoted to design. If the companies had design activities, they were asked first, whether they were sourced from within the company or externally. Spending was also required – both on internally as well as externally provided activities. For internally developed design, it was also asked whether the development was intended for own use or was developed for others. Again, the expected duration of benefits from new design was asked for. Comments were also invited.

Section F was devoted to business organization and improvement of management and production processes. It comprised 6 questions, which investigated first whether the company invested into corporate reorganization, if yes, whether these were internally provided or also externally, the spending on each of the activities (internal and external). The survey also asked the firms to evaluate the expected duration of benefits from these investments. In addition, knowledge transfer in terms of consultancy were examined. At the end of each section companies could provide additional comments.

Section G was devoted to other activities aimed at increasing intangible capital. The section (4 Yes/No questions) investigated whether companies were involved in mining research by themselves or with the help of other firms and creation or duplication of literary and artistic works.

Last section was devoted also to the effect of the crisis on intangible investments, investigating two aspects. First, the study examined how in the period between 2011 and 2013 components of intangible investments changed (into training, investment into R&D, image and brands, etc.), whether the investments increased, decreased or remained stable. In addition, the survey also examined, which measures were employed by the company to fight the crisis. Here, different strategies were possible – from outsourcing, internationalization, innovation, etc.

3.3.2 *Methods*

The questionnaire is relatively long with 46 questions, although in fact it is repetitive in nature, similarly as the UK survey on Investment in intangible assets. In structure it is very similar to the UK study, although it is broader than the UK study in two topics: crisis and other elements, which referred to investing into new mining resources (mineral explorations).

Again, similarly as the UK study for each of the topics, several aspects were investigated:

- Whether a type of investment was made;
- Spending on external sources providing a certain type of asset;
- Spending on internal sources;
- Expected duration of benefits.

The questionnaire relied on two types of questions:

- Simple Yes/No question, which were used to see whether a specific firm had investments of a certain type
- Questions asking for a numerical answer, specific information (value of expenditure and duration of benefits)

Consistency in structure with regards to the nature of questions simplifies the work for the respondent.

But similarly, as was said for the UK survey, the simplicity also carries a certain amount of disadvantage:

- 1) First, only overall values for overall amount of intangible investment type into a certain type are being collected,
- 2) while also in this Italian survey no further details about the structure of specific type of intangible investments are not available.

- 3) Furthermore, similarly as in the UK survey the related relevant business aspects like motivations, expected benefits, causes of benefits, linkages between type of intangibles and specific benefits, are not studied.
- 4) Consequently, the extensive effort invested into the collection of intangible investment data leaves the researcher with limited analytical options.
- 5) But in contrast to the UK study the definition of cost categories in a few examples is better.

3.4 Prašnikar et al. (2012) approach

The study of intangible capital in the Balkan region was carried out by a team of researchers from the University of Ljubljana, led by Prašnikar, while the interdisciplinary team comprised members from many fields of economics and business in order to be able to appropriately capture the nature of different dimensions of intangibles. Their first survey-based study of intangible capital was carried out in 2010 among largest manufacturing companies in Slovenia, followed by an extended study to services sector in 2011. Good results allowed the extension of the study to Bosnia and Hercegovina and Albania in 2012. Later, the methodology was extended also to the public sector in 2015.

3.4.1 Questionnaire structure by topic

The survey (part on intangibles) comprised in total 41 questions with many of them comprising of several sub-questions. The questionnaire examined standard intangibles components as well as extended the Corrado et al. (2006) definition of intangible capital. The questionnaire was divided into 7 sections focusing on different aspects of intangible capital (informational and relationship capital with information technology, branding and brand capital, innovation and R&D, social capital, economic competencies with HRM and organization, and also access to finance due to the relevance of the topic at the time). The last section focused on general company data, primarily financial, including the structure of investment.

The standard components of intangible capital were studied first. **Information and communication technology section** was divided into three parts. The first part first focused on ICT and ICT investment, the second part examined the strategic orientation of firms towards the role of ICT and the organizational position of ICT (e.g. hierarchical level of IT manager in the firm). At the end, also the strategic importance of ICT in company documents, and implementation of IT plan was analysed.

Research and development, which is the second Corrado et al. (2006) component, comprised 10 questions, studying product and process innovation, sources of information, organization of R&D activity and competences and capabilities. The questionnaire also took into account the characteristics of the target markets (domestic or exporter, including target exports market) due to the export-led hypothesis and knowledge transfer, which is especially important in catch-up economies. The questionnaire also examined comparative corporate performance in terms of product/process innovation and types of product/process innovation. It also captured the share of revenue dedicated to R&D and the organization of R&D. Next, sources of innovation ideas and

information were examined (external and internal). Last, technological, marketing and complementary competences were studied.

Corrado et al. (2006) definition then focuses on economic competencies. Following their definition, the questionnaire captured also branding and brand capital, HRM and organization. Branding and brand capital part comprised 5 questions studying brand development, brand value, brand investment, marketing innovation and future orientation. Brand development was measured through brand management activities (including information on own brand development, corporate and separate product/services brand development, it also studied brand architecture). The questionnaire also studied brand protection, financing of brand development and possibly if companies measure brand value. The questionnaire also collected information on brand investment, i.e. share of sales for activities to increase the value of brands were measured (e.g. costs of advertising and marketing activities of advertising agencies and media).

HRM and organization studied the following aspects of intangible capital: human capital and motivation, organizational climate and organizational structure. The questions also captured the organization of training in the company, the extent of the different trainings offered, transfer of knowledge within the company, managing and developing core group of employees, and worker performance. Last, satisfaction and motivation of employees were examined, as well as organizational flexibility.

The survey as said relied on the existing Corrado et al. (2006) definition of intangible capital, but it also extended the Corrado (2006) definition of intangible capital by introducing 4 new components.

- 1) Informational capital, which refers to information and knowledge that the firm has about its products, also its processes (including production), customers and suppliers and resources that the firm uses, including the knowledge about competitors.
- 2) This informational capital is closely linked to the second extension, the relational capital, which incorporates knowledge on the aforementioned aspects of competitors, their processes, products, resources, customers, which allows the company to derive competitive advantage. **Relational and informational capital** were examined with 10 questions, examining the relations with customers, competition and suppliers. The first major component of informational capital was export orientation, followed by the examination of customer-company relationship and the impact of this relationship on product development. Corporate business environment is studied next, primarily with the focus on the intensity and consequences of competition, primarily also in relation to innovation activity. Last, the questionnaire examines suppliers, their country of origin due to the expected link between supplier and corporate innovation performance.
- 3) Social capital was the next addition to the intangible capital definition. It focuses on the focusing on the relationships between workers, management and owners, that is interest groups, and the impact of their relative power on firm behaviour and strategy. These relationships are particularly important in former socialist countries, related also to the current

ownership structure and the privatization models. **Social capital or the role of the interest groups in the company** were examined via seven questions. The problem of the role of interest groups in view of strategic firm orientation is particularly relevant for transitional countries, because of the ownership structure (and in transition economies also privatization). This sub-set of questions also indirectly addressed the role of industrial relations on strategy. This topic was examined via three parts, one dealing with ownership structure, second with employment characteristics in firms, the nature of wages, and presence of worker unionization and at the end decision making and risk sharing is studied.

- 4) In addition, the survey conducted in Slovenia (but not in other countries) extended the definition of intangible capital also with eco-capital, which focused on strategic issues regarding sustainable development, its role in corporate strategies and perceived impact on firm position, as well as surveying very specific behaviour (specific data) on eco standards, waste management, etc.

3.4.2 Methods

The questionnaire comprises three types of questions:

- cascading type of questions,
- Likert scale questions and
- questions requiring specific piece of information (employment, expenditure on different investment, etc.).

The authors explain that the use of the Miyagawa et al. (2010) cascading approach is an important innovation, allowing the achievement of two goals:

- the cascade allows building a measurement scale 1 to 4, allowing variability and consequently better analysis due to a wider range of possible approaches (example provided in
- Table 3). Namely, the cascade is a set of three simple statement, which each represents a higher “level of development” of a certain field/aspect. Based on the number of consecutive Yes/No answers, the total score is between 1 and 4³. Also, each statement can be used in the analysis separately, just as Yes/No.
- the cascade comprises three simple and straightforward statement, with Yes/No answers, allowing respondents to do through the questions quickly. This lowers the dropout and provides higher data quality.

³ If the first answer is ‘no’, the company is awarded ‘1’. If the first answer is ‘yes’, it is awarded ‘2’. If the answer to the second sub-statement is ‘no’, the value remains at ‘2’, if the answer is ‘yes’, it rises to ‘3’. If all sub-statements get affirmative answers, the total value amounts 4, indicating the highest possible attainment in a specific field.

Table 3: Example of cascade question from HRM: question 2

	NO	YES
Do you measure performance in such a way that you can clearly distinguish between high and low performers?		
Are better performers better rewarded for their work than average performers?		
Do you apply any other warning sign than oral reprimand for low performers to let them know of their substandard performance?		

Source: Intangibles questionnaire for Albania, 2011.

Prašnikar et al. (2012) explain that use of the cascading technique was an important innovation. They conducted extensive testing and found that companies and primarily also respondents have often insufficient knowledge or information about specific data (numerical data). The problem was even more pronounced in smaller companies as well as in companies, which are more diversified. Personal contact (when testing questionnaires) also revealed the importance of short, simple questions or statements. Cascades allow full capture of the problem while ensuring quality and reliability of data.

The questionnaire comprised also some Likert scale questions, normally a 1 to 5 scale, depending on the focus of the question (Table 4).

Table 4: Example of a Likert scale question from innovation on complementary competences (assess agreement on scale 1 to 5)

Complementary competences	1	2	3	4	5
Activities of the business units are clearly defined in the corporate strategy of our firm. E9_1					
Good transfer of technological and marketing knowledge among businesses units. E9_2					
The intensity, quality and extent of research and development knowledge transfer in co-operation with strategic partners E9_3					
Product development is cost efficient. E9_4					

Source: Intangibles questionnaire for Albania, 2011.

Questionnaire also comprised several standard questions asking for a specific piece of information (market shares, sales, expenditure, etc.) (Table 4). This type of question was used primarily in the last part, where specific company data was asked for, needed for the study of the link with productivity.

Table 4: Example of a question with specific data from branding/marketing section

Please, provide the value for the following categories in 2010	
Net sales	
Labour costs	
Number of employees (on Dec 31)	
Fixed capital assets (on Dec 31)	
Depreciation of capital	
Material costs	

Source: Intangibles questionnaire for Albania, 2011.

Authors stress that the questionnaire provides an extension to the (then) existing approaches in three major aspects:

- it is focused on developing countries and does not examine only standard questions (e.g. following Community Innovation Survey for innovation), but adds also aspects, which are typically important for innovation in catch-up economies;
- cascading approach, relying on simple Yes/No statements, which increased reliability and quality of data, allowing also more variety in statistical analysis than simple Yes/No questions.
- The questionnaire focuses not only on the amounts of intangibles (primarily in comparative perspective), but also on understanding the factors behind intangible investments.

3.5 Comparative analysis of the approaches

The literature on intangible capital is widening fast, but so far, only four more cited surveys have been conducted in the EU to collect the data on intangible investment. Table 2 briefly summarizes all surveys. The UK and Italian survey are very similar : both are focused on capturing values of main components of intangible investments, capturing 4 key elements: 1) whether the company invested at all (Yes, No), 2) how much was the cost of internal investment into a specific category, 3) how much was spent for external purchases and 4) the expected duration of benefits from a specific investment. Both surveys are short and simple to understand (less simple to answers as details about the values are required), but the surveys offer little details on sub-categories and primarily provide little (Italian) or almost no additional insight into the motivations of management for such investment, obstacles, expected benefits (e.g. competitiveness, etc.).

Eurobarometer survey is deeper in the number of additional information it captures (motivations, drivers and barriers, examination of sources, ownership, etc.), but the majority of questions do not provide euro values but are in fact categorical variables with pre-defined value ranges, which often have very broad ranges (25-50%) and also are not based on realistic values (investments to be 25-50% of revenue). Nonetheless, the survey is short and simple for respondent to fill in, questions are easy to understand. From an analytical perspective, especially with regards to linking intangibles to firm performance, the use of data is limited due to the nature of variables and the data collected.

Prašnikar et al. (2010-2015) study differs from the UK and Italian approach most, since it is broadest and least focused on collecting actual monetary values on specific investment. The questionnaires (specially the one used for Slovenian case) first extends the definition of intangible capital with 4 new components. Second, it provides significant amount of additional information, from motivations, obstacles, expected benefits. The questionnaires are primarily based on a cascading approach, which simplifies the work of the respondents, but from an analytical perspective, the use of data is limited due to the nature of variables and the data collected.

The questionnaires differ significantly. Since the purpose of an intangible capital analysis is to understand not just the size, but also the logic (motivations, obstacles, etc.) of intangible investment, a good questionnaire should find the right balance between topics and nature of data collected.

4 A proposed measure of intangible capital using various existing Eurostat (survey) data

In order to investigate the possibility to establish a pan-European analysis of intangible investment in the corporate sector (public sector has several specifics) without extensive additional effort, we investigate the existing indicators available at Eurostat, collected through several surveys that are being conducted by national statistics and reported to Eurostat. Relying on such data and perhaps amending the existing questionnaires/methodologies by a few questions/modifications would allow an efficient collection of data, minimizing time and cost effort of national statistics and respondents, ensuring also higher data quality. In addition, such an approach would also allow researchers to use additional information from the surveys (original databases), which often also include variables that explain motivations, expected benefits, related phenomena etc. This would allow a more detailed study and understanding of the intangible capital accumulation.

Eurostat's mission is to provide high quality statistics at European level that enable comparisons between countries and regions. Eurostat tries to arrive at a common statistical 'language' that embraces concepts, methods, structures and technical standards. Eurostat does not collect data. Eurostat's role is to consolidate the data collected by national statistical systems and ensure comparability, using harmonized methodology, as much as possible. Data collection methods often differ across countries because national statistical systems have access to different data sources at national level (registers, other administrative sources, surveys, big data). Eurostat thus typically employs "output harmonisation", that is conceptual harmonisation of target variables.

In order to propose a measure of intangible investment we follow the prevailing approach at the moment, which are the ONS (UK) and Italian survey on investment into intangible assets. These two surveys focus on the following:

- First, whether the company invested at all in specific component of intangible assets, where the following components were examined:
 - Software
 - R&D
 - Training
 - Reputation and branding
 - Design
 - Organization or business process improvement
- What the business expenditure was on investment into each specific component of intangible assets provided by external providers;
- What the expenditure was on investment into each specific component of intangible assets within the organization;
- How long the firm expected to benefit from specific intangible asset component.

The analysis in continuing is built as a case study based on Slovenian governmental surveys conducted by the Slovenian national statistical institute (NSI). The decision to take Slovenian surveys as a starting point was based on two factors:

- Since Eurostat does not have a unified methodological approach for at least some indicators, we had to choose one approach as the benchmark approach. Namely, Eurostat does publish the same indicators for all countries, but the data collection and the estimation behind the indicator may differ. As was already pointed out, data collection methods often differ because national statistical systems have access to different data sources at national level, often due to institutional differences between the countries. As a result, the quality – cost/burden trade-off and the most cost-effective data collection method can be different across countries so NSIs often rely on different data sources (registers, other administrative sources, surveys, big data).
- Therefore, the decision was to choose Slovenia due to extensive methodological knowledge about the approaches used by the Slovenian NSI and the methodological cooperation of our team members with them. The Slovenian NSI also provides methodological documentation that sheds light on geographical comparability of Slovenian data with data in other EU countries.

Consequently, the rest of the chapter is organized in the following manner:

- The analysis is limited to the corporate sector (generally, also referred to as ‘business economy’ in structural business statistics or ‘business enterprise sector’ in R & D official statistics).
- For every component of intangible capital, survey questionnaires are canvassed to identify relevant survey questions and links are established to a relevant indicator or a set of relevant indicators in the Slovenian official statistics.
- Indicators are then identified at the EU-28 level that are similar (or, preferably, the same) as in Slovenia and would consequently allow creation of a comparable “intangible capital component” variable.
- The end of the chapter provides a short list of recommendations on how methodological extensions of existing data collection methods would allow also intangible capital measurement.

4.1 Computerized information

Computerized information aims, according to Corrado *et al.* (2006) definition, to cover two key components: software and databases. Following the definition and by assessing currently available data sources, we aim:

- To determine whether the company invested in software and databases (internally and/or purchased externally);
- To quantify the size of the investment.
- To estimate the depreciation of intangible assets of computerized information.

Existing questionnaires also allow the measurement and understanding of other relevant aspects (motivations, expected results, problems in investment, etc.). These additional details are not discussed here in detail but would represent significant value added to the researchers, when studying intangibles.

4.1.1 *The case of Slovenia*

In Slovenia, the relevant data to comprise “computerized information” can be found in two different questionnaires:

- Questionnaire for statistical survey *Investment in fixed assets* in enterprises (slo. Vprašalnik za statistično raziskovanje Investicije v osnovna sredstva, za leto 2018⁴)
- Questionnaire for statistical survey *Use of information-communication technology (ICT) in enterprises* (slo. Vprašalnik za statistično raziskovanje Uporaba informacijsko-komunikacijske tehnologije (IKT) v podjetjih, 2019⁵)

The questionnaire for statistical survey ***Investment in fixed assets in enterprises*** provides a number of relevant variables, not only for the computerized information segment, but also for the innovative property. The survey runs annually from 1967 in enterprises and organizations with 20 or more employees but also includes units with less employees having more than 1 million EUR investment according to VAT data. All activities, except for NACE sections T (households) and U (extraterritorial), are covered. The sample size for enterprises (corporate sector) is about 3000 (out of around 60 thousand), while the sample for the public sector comprises around 2000 units (Statistični urad Republike Slovenije, 2018b, 2018a).

The survey collects detailed data on values of expenditures for the following blocks of questions, which are relevant for the computerized information component (see also Table 5):

- C1 purchased computer software (software)
- C2 purchased computer databases
- C4 own developed computer software and its own developed databases

The questionnaire for statistical survey ***Use of information-communication technology (ICT) in enterprises*** provides a lot of other relevant information. The survey was last conducted in 2019, and last updated in 2018. It has been conducted since 2004, but the questionnaire is changing in structure and topics along with the development of the technology. The survey covers companies with 10 or more employees in economic activities NACE C-N, except for financial services (K). The sample is stratified by size and activity. It is important to note that the data are being collected on the basis of an EU regulation and comparable within the EU.⁶

4 (Statistični urad Republike Slovenije, 2018b)

5 (Statistični urad Republike Slovenije, 2019)

6 Collected on the basis of Regulation (EC) No. 808/2004 of the European Parliament and Council concerning Community statistics on the information society. See also explanation in Chapter 4.1.2.

The following indicators might be used to evaluate the extent of use of software (but only *indirectly* via the use of hardware) (Statistični urad Republike Slovenije, 2019):

- percentage of persons employed using their desktop, portable, tablet computer, or advanced smartphone application,
- percentage of persons employed using a computer (computers of all kinds), a portable device or a mobile phone, connected to the Internet in their work.

The internal development efforts and the purchases of ICT services externally could be (some again indirectly) evaluated via the following indicators (based on Yes/No questions unless indicated otherwise) (Statistični urad Republike Slovenije, 2019):

- employment of ICT specialists,
- internal or external training to refine or acquire ICT related skills of personnel or ICT specialists,
- vacancies for and recruiting of ICT specialists,
- own or external maintenance of ICT infrastructure, own or external support in the use of ICT, own or external development, upgrading or adapting of ICT; and ensuring of the safe use of ICT and data protection,
- own or external activities of safe use of ICT,
- employment of ICT specialists, who were also involved in the development of computer software or databases? (in addition to the Yes/No question, also the number and amount of time spent as % of all working hours).
- The data on actual external purchases only refer to presence/absence, consequently, it would be necessary to somehow capture also the values of these purchases.

Eurostat disseminates these indicators as percentage of a relevant base (e.g. percentage of companies that report the presence of a specific characteristic; percentage of employment with a specific characteristic, etc.).

4.1.2 Eurostat data

Three specific data sources can be considered at Eurostat level as well:

- Community survey on ICT usage and e-commerce in enterprises
- Community Innovation Survey (Eurostat, 2019a)
- data on investments from ESA2010 (as a possible third source, but typically not available as firm-level data)

As said, the data on **ICT usage and e-commerce in enterprises** is collected based on Regulation (EC) No. 808/2004 of the European Parliament and Council concerning Community statistics on the information society, as well as the annual implementing regulations, where the variables monitored for each year are defined. The data are transmitted once a year to Eurostat and are comparable with the data of other Member States of the European Statistical System. The detailed list of variables provided

is available at Eurostat with also detailed information about which variables were collected for which year (Eurostat, 2019e). In principle, the same set of variables could be included as was indicated also at the analysis of the Slovenian case. These are:

- percentage of persons employed using their desktop, portable, tablet computer, or advanced smartphone application,
- percentage of persons employed using a computer (computers of all kinds), a portable device or a mobile phone connected to the Internet in their work,
- employment of ICT specialists,
- internal or external training to refine or acquire ICT related skills of personnel or ICT specialists,
- vacancies for and recruiting of ICT specialists,
- own or external maintenance of ICT infrastructure, own or external support in the use of ICT, own or external development, upgrading or adapting of ICT, and ensuring of the safe use of ICT and data protection,
- own or external activities of safe use of ICT,
- employment of ICT specialists, who were also involved in the development of computer software or databases? (in addition to the Yes/No question, also the number and amount of time spent as % of all working hours).

From the perspective of the intangible investment and capital study, the coverage is problematic as values can only be calculated based on combining this dataset with data on total employment and total number of hours worked as well as data on wages. This would allow an approximation of the estimated software development within the firm. The data on external purchases only refer to presence/absence, consequently, it would be necessary to somehow capture also the values of these purchases.

Another possible source of information about the expenditure on software is also **Community Innovation Survey** (Eurostat, 2019a). Expenditure on software is included, but unfortunately as part of a broader category (Expenditure for acquisition of machinery, equipment, software & buildings).

At the Eurostat level, suitable survey data to fully capture the value of computerized information is not available.

The data on **investments in fixed assets** are collected by the Statistical office of Slovenia with a special annual survey, while other countries mostly collect this data in the framework of structural business statistics (SBS) with a dedicated survey. In Slovenia, there is no SBS survey because most variables required for SBS can be compiled as a combination of already existing sources. Investment data are thus collected in this special annual survey and also serve the needs of the SBS (e.g. S15 11 0 Gross investment in tangible assets, ...). All items in SBS are higher because they follow a broader definition (including the value of land purchase and related transaction costs), but the total is lower because SBS cover only NACE sections B–N (except K finance) plus division S95 while the special survey covers all NACE sections except T & U, which led gross fixed capital formation to be 31.7% higher according to the special survey than in SBS in 2014 (Statistični urad Republike Slovenije, 2012).

At the moment, Eurostat provides computerized information data only at an aggregated and not firm-level data. National statistical institutes transmit data to Eurostat according to the plan, reported in the European system of accounts - ESA2010, Transmission programme of data (Europäische Gemeinschaften, 2014). At the national and industry level, a number of indicators both at the level of gross fixed capital formation as well as fixed assets are being collected and disseminated. For gross fixed capital formation, for example, the following categories are reported at national and industry level, where variable N1173G is important for assessing the computerized information component (Europäische Gemeinschaften, 2014):

- N11G Total fixed assets (gross)
- N11KG Total Construction (gross)
- N111G Dwellings (gross)
- N112G Other buildings and structures (gross)
- N11MG Machinery and equipment and weapons systems (gross)
- N1131G Transport equipment (gross)
- N1132G ICT equipment (gross)
- N11321G Computer hardware (gross)
- N11322G Telecommunications equipment (gross)
- N11OG Other machinery and equipment and weapons systems (gross)
- N115G Cultivated biological resources (gross)
- N117G Intellectual property products (gross)
- N1171G Research and development (gross)
- N1173G Computer software and databases (gross)

Aggregated national and industry data provided at Eurostat cannot be reliably disaggregated to the firm level as investment might not be so strongly correlated to known firm characteristics such as size and industry. Besides having only aggregated national and industry data, and not firm-level data, it is not possible to divide the gross fixed capital appropriately to firm level even with modelling. In addition, it is not possible to divide the gross fixed capital formation in software and databases directly into purchased and own-account. This division again would have to be done indirectly by subtracting the values of the purchased, which would again be approximated by ICT sector. Overall, a significant amount of approximation would be required.

Table 5: Summary of indicators and data sources on computerized information

	Slovenia*	Eurostat
	Sources of data	
Sources and relevant variables	Survey Investment in fixed assets in enterprises (slo. Vprašalnik za statistično raziskovanje Investicije v osnovna sredstva, za leto 2018 ⁷), Questions on Investments and Disinvestments in Intangible Assets with data on: <ul style="list-style-type: none"> - C1 purchased computer software (software) - C2 purchased computer databases - C4 own developed computer software and its own developed databases 	Sufficiently comprehensive survey data does not exist at EU level. Conceptually closest data available in two data sources comparable at the EU level: <ul style="list-style-type: none"> - via European system of accounts - ESA2010, Transmission programme of data (Europäische Gemeinschaften, 2014) is category N1173G Computer software and databases (gross) within a broader category N117G Intellectual property (but this is not firm-level data), or - SBS variable 15 44 1 Investment in purchased software but it is only collected every three years for industry & construction.
	Survey Use of information-communication technology (ICT) in enterprises , (slo. Vprašalnik za statistično raziskovanje: Uporaba informacijsko-komunikacijske tehnologije (IKT) v podjetjih, 2019 ⁸) A broader category of expenditure included in CIS survey (Expenditure for acquisition of machinery, equipment, software & buildings)	Survey ICT usage and e-commerce in enterprises Regulation (EC) No. 808/2004 of the European Parliament and Council concerning Community statistics on the information society, Harmonized within the EU A broader category of expenditure included in CIS survey (Expenditure for acquisition of machinery, equipment, software & buildings)
Alignment with intangible capital concept		
Coverage of the concept	Yes	Partial. Expenditure values not available at firm level except for purchased software in industry & construction otherwise only very aggregated items via ESA2010. Expenditure included in CIS survey but only as part of a broader category (Expenditure for acquisition of machinery, equipment, software & buildings)
Presence of this type of investment	Yes (based on values)	Identified indirectly and partially (based on employment of ICT specialists involved in the development of computer software or databases, and purchased software in industry & construction).
Value invested in purchase	Yes	Partial. SBS variable 15 44 1 Investment in purchased software for industry & construction. Methodological challenges if using indirect calculation from national accounts. Expenditure included in CIS survey as part of a broader category (Expenditure for acquisition of machinery, equipment, software & buildings).
Value invested in own development	Yes	No. Methodological challenges if using indirect calculation from national accounts.
Depreciation	No	No
Sample size	Around 3000 units for survey Investment in fixed assets in enterprises, around 1800 units for ICT survey and around 2800 for CIS.	Varies by country
Periodicity	Annual survey on investments. Annual survey on ICT usage in firms, but questions change in time. Bi-annual CIS.	Multiannual SBS for relevant variables. Annual survey on ICT usage in firms, but questions change in time Bi-annual CIS.
Firm level data available	Yes, sample	Yes for ICT usage and Investment in purchased software for industry & construction. No for N1173G Computer software and databases

*SORS – Statistical office of the Republic of Slovenia

⁷ (Statistični urad Republike Slovenije, 2018b)⁸ (Statistični urad Republike Slovenije, 2019)

4.2 Innovative property

Innovative property aims, according to Corrado *et al.* (2006) definition, to cover the following components:

- R&D, including social sciences and humanities
- Mineral exploration and evaluation
- Copyright and license cost
- Development costs in financial industry
- New architectural and engineering designs

In this analysis, similarly as in the case of computerised information, we assess existing data sources:

- To determine whether the company invested in the aforementioned components of innovative property (internally and/or purchased externally);
- To quantify the size of the investment;
- To estimate the depreciation of intangible assets of innovative property.

A general comment regarding existing questionnaires, that they allow the measurement and understanding of other relevant aspects (motivations, expected results, problems in investment, etc.) should also be made here.

4.2.1 The case of Slovenia

To capture the value of innovative property, two different survey questionnaires can be used in Slovenia:

- Questionnaire for statistical survey *Innovation activity in industry and selected services* (slo. Vprašalnik Inovacijska dejavnost v industriji in izbranih storitvenih dejavnostih) (Statistični urad Republike Slovenije, 2017b)
- Questionnaire for statistical survey *Investment in fixed assets in enterprises* (slo. Vprašalnik za statistično raziskovanje Investicije v osnovna sredstva, za leto 2018⁹)

From the questionnaire for statistical survey ***Investment in fixed assets in enterprises*** (Statistični urad Republike Slovenije, 2018b), the following variables provide information about investment expenditure into innovative property:

- C5 entertainment, literary and other artistic originals
- C6 studies, project documentation
- C7 trademarks, concessions and goodwill
- C8 patents, licenses for the use of patents and scientific research and development works

⁹ (Statistični urad Republike Slovenije, 2018b)

Comparing these categories to Corrado *et al.* (2006) categories (Table 6) shows that although the match between the definition and the survey on investment in fixed assets is not perfect, it is relatively good. Providing that a unified definition of intangible investment at the EU level existed, this questionnaire could easily be extended in Slovenia to fit better with either the existing Corrado *et al.* (2006) definition or a modified EU definition

Community Innovation Survey has been conducted in Slovenia since 1997 when data referred to the period 1994–1996 (slo. Inovacijska dejavnost v industriji in izbranih storitvenih dejavnostih). The 2010 and more recent survey questionnaires (Statistični urad Republike Slovenije, 2017b) provide investment expenditure for the following categories:

- In-house R&D
- External R&D
- Acquisition of machinery, equipment, software & buildings
- Acquisition of external knowledge
- Training for innovative activities
- Market introduction of innovations
- Design
- Other innovation activities
- Total expenditure for innovation activities

Specifically, to capture the value of innovative property, the following expenditure categories would be relevant (text in bold highlights categories, more relevant for innovative property):

- **In-house R&D**
- **External R&D**
- Acquisition of machinery, equipment, software & buildings
- **Acquisition of external knowledge**
- Training for innovative activities
- **Market introduction of innovations**
- **Design**
- **Other innovation activities**
- Total expenditure for innovation activities

Since the existing questionnaire design does not overlap completely with the Corrado *et al.* (2006) definition (Table 6, text above), a consensus would be needed regarding the categorization of the other variables:

- Acquisition of machinery, equipment, software & buildings
- Training for innovative activities

Table 6: Sources for expenditure on innovative property in Slovenia

Corrado et al. (2006) category	Slovenian data source	
	Category	Data source
R&D, including social sciences and humanities	C8 patents, licenses for the use of patents and scientific research and development works C7 trademarks, concessions and goodwill	Survey Investment in fixed assets in enterprises
	In-house R&D External R&D Other innovation activities	Community Innovation Survey (Slovenia)
Copyright and license cost	C8 patents, licenses for the use of patents and scientific research and development works C7 trademarks, concessions and goodwill	Survey Investment in fixed assets in enterprises
	Acquisition of external knowledge	Community Innovation Survey (Slovenia)
Mineral exploration and evaluation	C6 category (studies, project documentation) but only for companies in relevant NACE section B. For other companies (e.g. from manufacturing or other industries), division based on existing survey data is impossible to envision.	Survey Investment in fixed assets in enterprises
		Community Innovation Survey (Slovenia)
Development costs in financial industry	Categories for new product development costs in financial industries (innovation expenditure)* – Categories C5-C8 but in financial industry companies only.	Survey Investment in fixed assets in enterprises
	In-house and external R&D but only in financial industries, paying attention to avoid double counting.	Community Innovation Survey (Slovenia)
New architectural and engineering designs	C5 entertainment, literary and other artistic originals C6 studies, project documentation	Survey Investment in fixed assets in enterprises
	Design	Community Innovation Survey (Slovenia)

Generally, the CIS-based Slovenian survey provides abundant data on innovation. Primarily, besides providing values (euro-based expenditure), the CIS survey also investigates other aspects, relevant both for innovation activity as well as investing into innovative property in general (where in many countries according to Van Ark et al. (2009) this category can reach half of all intangible investments):

- General information about the company (including the main market, important due to knowledge transfer);
- Types of innovation (product, process, marketing, market, organization, logistics);
- Whether innovation was a breakthrough or marginal, novel just for company or globally;
- Types of research and development activities (internal, external, purchases, etc.);
- Sources of information;
- Cooperation in research with partners and location of partners;
- Obstacles to innovation;
- Turnover from novel products (benefits from innovation)

Many of the listed variables are not only relevant for understanding the complexity of innovation, similar factors will drive also investment into other intangible resources (Prasnikar, Redek, & Drenkovska, 2017). Consequently, CIS, being also a firm-level database, can serve as an important

source of information for understanding intangible capital. To understand better the logic of intangible investment some of the questions from CIS would be relevant for other aspects of intangible innovation (computerized information and economic competencies). Consequently, some of the questions could be included in relevant other surveys.

To provide also additional information on expenditure, the national accounts data can be used. These can both be used for Slovenia as well as other EU countries, as methodology is based on ESA2010 (*Europäische Gemeinschaften, 2014*). But these again are not survey data and are not available at firm level. ESA2010 provides the category *N1171G research and development* relevant for innovative property component within a broader category *N117G Intellectual property* that also includes *N1173G computer software and databases*, more relevant for computerized information.

4.2.2 Eurostat data

Similarly as in Slovenia, innovation data in the EU is mostly collected using the **Community Innovation Survey (CIS)**, which is generally conducted every two years (last in 2018) but compiling CIS data is voluntary. This means that in different survey years different countries are involved (Eurostat, 2019a). Generally, the CIS' harmonized approach is intended to capture innovativeness of sectors by type of enterprises, provide details on the different types of innovation, how innovations are being developed, why companies innovate, where they get the information, knowledge, where they obtain funding, etc. Besides being available at micro level (firm-level data upon request) the CIS data also allows comparisons by countries, type of innovators, economic activities and size classes (Eurostat, 2019a).

Despite the voluntary nature of CIS implementation, national statistical institutes are nonetheless obliged to deliver certain variables to Eurostat. Microdata access is available for a number of countries (Eurostat, 2019a). For example, for 2014 researchers had access to secure-use files in Eurostat's Safe Centre with data for all countries except Denmark, Ireland, The Netherlands, Austria, Poland, Slovenia, Malta and the UK (Eurostat, 2019a). The following categories are available to assess the expenditure on innovative activities (question 5.2 in CIS2014 questionnaire, available at (European Commission, 2019)):

- In-house R&D (Include current expenditures including labour costs and capital expenditures on buildings and equipment specifically for R&D)
- External R&D
- Acquisition of machinery, equipment, software & buildings (Exclude expenditures on these items that are for R&D)
- Acquisition of existing knowledge from other enterprises or organisations
- All other innovation activities including design, training, marketing, and other relevant activities
- Total of the above innovation activities

From the perspective of studying intangible investment into innovative property, Eurostat collects and publishes only a selection of indicators. The following are relevant and available at Eurostat as well (European Commission, 2019):

- Types of innovation
- Product and/or process innovative enterprises by type of innovation activity, NACE Rev. 2 activity and size class Enterprises that introduced innovation of specific types by type of the innovation, NACE Rev. 2 activity and size class
- Product and process innovative enterprises which introduced innovation by type of innovation, innovation developer, NACE Rev.2 activity and size class
- Information and cooperation in the innovation process
- Product and/or process innovative enterprises engaged in co-operation by co-operation partner, NACE Rev. 2 activity and size class
- Product and/or process innovative enterprises which used information for their innovation activities, by source of information, level of importance of the source, NACE Rev. 2 activity and size class
- Obstacles to innovation
- Innovative enterprises by hampering factor for innovation activities, level of importance of the hampering factor, NACE Rev. 2 activity and size class
- Non- innovative enterprises by barrier against innovation activities, level of importance of the barrier, NACE Rev. 2 activity and size class
- Innovative enterprises whose innovation activities have been affected by legislation or regulations by subject of the regulation/legislation, type of effect, NACE Rev. 2 activity and size class
- Innovative enterprises whose innovation activities have been affected, or not affected, by legislation or regulations, by type of effect, NACE Rev.2 activity and size class (inn_cis10 legis)
- Enterprise by place where goods and/or services are sold, and place of largest market in terms of turnover, by NACE Rev. 2 activity and size class
- But Eurostat also has expenditure data (as follows from the questionnaire).

Eurostat innovation data are consequently quite well suited for the study of investment in innovative property. A particular problem is only the lack of micro data for the countries, where CIS is either not used or data are not available for research purposes.

A specific challenge remains also the **question on depreciation, which is not covered**. But it could be added to the innovation survey relatively easily, perhaps as a categorical question following the Eurobarometer survey from 2013 (less than 1 year, 1-2 years, 2-5 years, 5-10 years, more than 10).

Table 7: Summary of indicators and data sources on innovative property

	Slovenia*	Eurostat
	Sources of data	
Sources and relevant variables	Survey Investment in fixed assets in enterprises (slo. Vprašalnik za statistično raziskovanje Investicije v osnovna sredstva, za leto 2018 ¹⁰), Questions on Investments and Disinvestments in Intangible Assets with data on: <ul style="list-style-type: none"> - C5 entertainment, literary and other artistic originals - C6 studies, project documentation - C7 trademarks, concessions and goodwill - C8 patents, licenses for the use of patents and scientific research and development works 	Comparable survey data not existing at EU level At the moment, conceptually closest (but not firm level) data available via: European system of accounts - ESA2010, Transmission programme of data (Europäische Gemeinschaften, 2014), category N1171G research and development (gross) within a broader category N117G Intellectual property
	Community Innovation Survey (slo. Inovacijska dejavnost v industriji in izbranih storitvenih dejavnostih, za leto 2014-2016 ¹¹)	Community Innovation Survey, with harmonized methodology but a very limited set of mandatory variables.
	Alignment with intangible capital concept	
Coverage of the concept	Yes, quite good, with two open issues: mineral exploration and cost of development in financial industries	Yes, quite good, with two open issues: mineral exploration and cost of development in financial industries
Presence of this type of investment	Yes (based on values)	Yes (based on values)
Value invested in purchase	Yes	Yes
Value invested in own development	Yes	Yes (but unclear separation between internal/external for some expenditure categories)
Depreciation	No	No
Sample size	Around 3000 units for survey Investment in fixed assets in enterprises and around 2800 for CIS.	Varies by country
Periodicity	Bi-annual	Bi-annual
Firm level data available	Yes, sample	Yes, sample

*SORS – Statistical office of the Republic of Slovenia

¹⁰ (Statistični urad Republike Slovenije, 2018b)¹¹ (Statistični urad Republike Slovenije, 2017b)

4.3 Economic competencies

The categories of economic competencies according to Corrado *et al.* (2006) definition comprise the following components:

- Brand equity (advertising expenditure, market research)
- Organizational structure (purchased, own account)
- Firm specific human capital (continuing vocational training, apprentice training)

The aim of this analysis is, similarly as in the case of the previous two components of intangible investment, to rely on existing resources:

- To determine whether the company invested in the aforementioned components of economic competencies (internally and purchased externally);
- To quantify the size of the investment;
- To assess the depreciation of intangible assets of economic competencies.

A general comment regarding existing questionnaires, that they allow the measurement and understanding of other relevant aspects (motivations, expected results, problems in investment, etc.) should also be made here.

4.3.1 The case of Slovenia

Due to the complexity of the innovation in economic competencies, each component is discussed separately. At the end of this section, a summary table provides the main findings.

4.3.1.1 Brand equity

Brand equity investment can be found in two important data sources (as listed)¹²:

- Questionnaire for statistical survey *Investment in fixed assets in enterprises* (slo. Vprašalnik za statistično raziskovanje Investicije v osnovna sredstva, za leto 2018¹³)
- Questionnaire for statistical survey *Innovation activity in industry and selected services* (slo. Inovacijska dejavnost v industriji in izbranih storitvenih dejavnostih (INOV) (Statistični urad Republike Slovenije, 2017b)

The first source *Investment in fixed assets in enterprises* provides values for selected broad types of intangible investment. For the category of brand equity, unfortunately, there is no separate category (categories collected listed below):

- C1 purchased computer software (software)
- C2 purchased computer databases

¹² When the questionnaire for structural business statistics was tested, also the »Marketing expenditure« variable was included, therefore attempts have been already made to assess these as well.

¹³ (Statistični urad Republike Slovenije, 2018b)

- C4 own developed computer software and its own developed databases
- C5 entertainment, literary and other artistic originals
- C6 studies, project documentation (include research and development work under C8)
- C TOTAL NS ($C1 + C2 + C4 + C5 + C6$)
- C7 trademarks, concessions and goodwill
- C8 patents, licenses for the use of patents and scientific research and development work

The highlighted categories C6 and C7 get the closest to the brand equity concept, but are at the same time too broad. Overall, a part of the questionnaire entitled “Investment in intangible assets” covers the relevant intangible capital components and could therefore be taken as a general measure, but the sub-category of brand equity cannot be extracted using existing data.

The second possible source is the *Community Innovation Survey*. The 2010 and more recent survey questionnaires provide several values on expenditure (as listed also in the chapter on innovative property). To capture brand equity, the following highlighted categories are relevant:

- In-house R&D
- External R&D
- Acquisition of machinery, equipment, software & buildings
- Acquisition of external knowledge
- Training for innovative activities
- Market introduction of innovations
- Design
- Other innovation activities
- Total expenditure for innovation activities

Therefore, the CIS allows answering the questions (following the UK and Italian intangibles survey):

- Whether the company invested in brand equity (if the reported value is zero, it did not)
- How large this expenditure was.

Unfortunately, based on existing data, it is impossible to distinguish, how much of this expenditure was intended to purchase services outside the company and what was used within the company. Depreciation cannot be determined, either.

In addition to the aforementioned data, CIS also provides data on marketing innovation in some more detail by a few Yes/No questions. These binary variables limit the analytical options for researchers, but they do provide some additional insights that at least allow the differentiation between companies. The questions ask whether the company (Eurostat, 2019a):

- Made significant changes to the aesthetic design or packaging of a good or service;
- Invested into new media or techniques for product promotion;
- Introduced new methods for product placement or sales channels;
- Introduced new methods of pricing goods or services.

4.3.1.2 Organizational structure

For organizational structure, we only consider the **Community Innovation Survey** (Inovacijska dejavnost v industriji in izbranih storitvenih dejavnostih (INOV) (Statistični urad Republike Slovenije, 2017b)). Unfortunately, the survey does not capture expenditure on organizational changes, rather it only captures a few categories of organizational innovation through three Yes/No questions. These questions ask whether the company introduced:

- New business practices for organising procedures (i.e. first time use of supply chain management, business re-engineering, knowledge management, lean production, quality management, etc.);
- New methods of organising work responsibilities and decision making (i.e. first time use of a new system of employee responsibilities, team work, decentralisation, integration or de-integration of departments, education/training systems, etc.);
- New methods of organising external relations with other enterprises or public organisations (i.e. first time use of alliances, partnerships, outsourcing or sub-contracting, etc.).

With the available data collected at the moment, therefore, three aspects cannot be clearly determined:

- The amount invested in organizational structure within the company;
- The external purchases of consulting that helped in adjusting organizational structure;
- Depreciation rate.

Table 8: Economic competencies data sources in Slovenia

Corrado <i>et al.</i> (2006) category	Slovenian data source	
	Category	Data source
Brand equity (advertising expenditure, market research)	Expenditure on: <ul style="list-style-type: none"> - C6 studies, project documentation (include research and development work under C8) - C7 trademarks, concessions and goodwill 	Survey Investment in fixed assets in enterprises
	Expenditure on: <ul style="list-style-type: none"> - Market introduction of innovations - Design Additional information provided on marketing innovation, but only Yes/No questions.	Community Innovation Survey (Slovenia)
Organizational structure (purchased, own account)	Very limited information, only data on whether companies invested into organizational structure change (Yes/No questions)	Community Innovation Survey (Slovenia)
Firm specific human capital (continuing vocational training, apprentice training)	Does company provide CVT Internal CVT costs External CVT costs A lot of additional CVT details No depreciation data	Survey Continuous education and training in companies

4.3.1.3 Firm specific human capital

The Corrado *et al.* (2006) definition defines the firm-specific human capital as investments into continuing vocational training (CVT), and apprentice training. The main source of data for firm-specific human capital investment in Slovenia is the statistical survey *Continuing vocational training in enterprises* (slo. Izobraževanje in usposabljanje zaposlenih v podjetjih (ŠOL-ZAP), (Statistični urad Republike Slovenije, 2015, 2017a)). This survey provides information about:

- provision of CVT courses and other forms of CVT in companies;
- CVT strategies;
- participants in CVT courses;
- costs of CVT courses;
- time spent in CVT courses;
- characteristics of CVT courses;
- assessment of CVT activities.

From the perspective of evaluating the firm-level investment into this intangible component (as in the case of UK and Italian surveys), the survey provides relevant data on:

- Whether the company conducted any CVT;
- Expenditure on CVT internally;
- Expenditure on purchased services for CVT.

With regards to conducting CVT, this survey uses Yes/No questions on whether the company conducted:

- CVT courses:
 - o CVT courses – internal;
 - o CVT courses – external;
- Other forms of CVT:
 - o Other forms of CVT - guided-on-the-job training;
 - o Other forms of CVT - job rotation, exchanges or secondments;
 - o Other forms of CVT - training at conferences, workshops, trade fairs and lectures;
 - o Other forms of CVT - learning/quality circles;
 - o Other forms of CVT - self-directed learning.

The questionnaire also provides information that allows the estimates of CVT costs, internal and external (although this break down is not published). In addition, the questionnaire provides the following relevant variables:

- Number of employees in surveyed companies
- Performed working hours in surveyed companies
- Labour costs (million EUR) in surveyed companies
- Number of participants in CVT courses in surveyed companies
- Total paid working hours in CVT courses in surveyed companies

- Total costs for CVT courses (in 000 EUR) (questionnaire covers separately cost for internal as well as those sourced externally)

A number of other details, relevant for the understanding of the CVT dynamics in companies are provided. Especially relevant for an in-depth understanding of this component of intangible investment are also:

- CVT strategies in companies;
- Organization of CVT activities;
- Participants' characteristics in CVT courses;
- Characteristics of CVT courses;
- Assessment of CVT activities.

Unfortunately, the survey does not provide information that would allow the calculation of depreciation rates.

4.3.2 Eurostat data

In the case of economic competencies, the available data both in Slovenia as well as in the EU are very similar. With the exception of the data from the survey *Investment in fixed assets in enterprises* (slo. Vprašalnik za statistično raziskovanje Investicije v osnovna sredstva, za leto 2018¹⁴), which only in a limited manner incorporates investment into brand equity, the other two relevant sources are the same:

- The first is the *Community Innovation Survey* (Eurostat, 2019a), where Slovenia uses the harmonised methodology (Inovacijska dejavnost v industriji in izbranih storitvenih dejavnostih (INOV) (Statistični urad Republike Slovenije, 2017b));
- While the second is the *Continuous Vocational Training Survey* (CVTS) (Eurostat, 2019f)(Eurostat, 2019c), where Slovenia also uses the harmonised methodology.

With regards to comparability of data, both CIS and CVTS are harmonized across EU member states (with few exceptions)¹⁵. A slightly bigger challenge is the periodicity of these surveys, since CIS is conducted every two, while CVTS every 5 years.

¹⁴ (Statistični urad Republike Slovenije, 2018b)

¹⁵ Survey done in line with Regulation No 1552/2005 for the implementation of CVTS 3 resulted in the limitation of comparability problems between countries, which was a problem in CVTS 2 (despite the agreed implementation guidelines). For CVTS 3, CVTS 4 and 5 most countries conducted their surveys in line with the regulations (Eurostat, 2019b).

Table 9: Summary of indicators and data sources on computerized information*

	Slovenia*	Eurostat
	Sources of data	
Sources and relevant variables	Community Innovation Survey (Slovenia)	Community Innovation Survey (harmonized questionnaire)
	Continuous Vocational Training Survey (Slovenia)	Continuous Vocational Training Survey (harmonized questionnaire)
	Alignment with intangible capital concept	
Coverage of the concept	Relatively good for brand equity Poor on organizational structure Good for CVT	Relatively good for brand equity Poor on organizational structure Good for continuous vocational training
Presence of this type of investment	Yes, for brand equity Yes, for organizational structure Yes, for CVT	Yes, for brand equity Yes, for organizational structure Yes, for CVT
Value invested in purchase	Partial for brand equity No for organizational structure Yes, for CVT	Partial for brand equity No for organizational structure Yes, for CVT
Value invested in firm own development	Partial for brand equity No for organizational structure Yes, for CVT	Partial for brand equity No for organizational structure Yes, for CVT
Depreciation	No	No
Sample size	Around 2800 units for CIS and around 2300 units for CVT.	Varies by country.
Periodicity	Brand equity and organizational structure provided in CIS (every two years) CVT every 5 years	Brand equity and organizational structure provided in CIS (every two years) CVT every 5 years
Firm level data available	Yes, sample	Yes, sample

*SORS – Statistical office of the Republic of Slovenia

4.4 Recommendations for possible intangibles analysis using Eurostat data

In continuing we provide a brief comment on the possible use of existing data, collected nationally and reported to Eurostat. Where these data (and surveys, on which the data is based) do not suffice, a short recommendation is made on how to adjust existing questionnaire to incorporate also the intangible capital aspect. The rationale is to use existing surveys, but with brief extension to capture also intangibles. By doing so, significant analytical value added is obtained, while keeping additional cost and burden for both respondents (firms) as well as national statistical institutes and Eurostat low. In addition, existing questionnaires also allow the measurement and understanding of other relevant aspects (motivations, expected results, problems in investment, etc.), very valuable to the researchers. In particular, if such data are available at firm level, which allows a combination of these data with other firm-level data.

With regards to general observation, three comments should be made:

- 1) A major obstacle to a systematic collection of intangible investment data at European or even broader level is the **lack of a detailed, generally accepted definition of intangible capital and its components**. At the moment, the prevailing Corrado *et al.* (2006) definition provides a strong start, but for comparable results, this or an adapted definition should become officially accepted and also suitable methodological guidelines must be prepared in much more detail and leave no doubt to respondents or researchers, which expenditure is included in a specific sub-category.
- 2) The first finding regarding the surveys and data collected at the European level is that the **existing surveys offer a significant amount of relevant data**. A thorough analysis of existing questionnaires would probably allow dispersed collection of relevant intangible capital and investment data with **relatively minor adaptation of several questionnaires**. Of course, the periodicity would remain the major obstacle (as not all surveys are conducted annually) as well as the voluntary basis for implementation of some surveys and a **non-harmonized approach or methodological differences between countries** in the preparation of some relevant indicators.
- 3) Another omnipresent challenge is also the **determination of suitable depreciation rates** or defining the period of use. None of the questionnaires, cited in this text as possible sources of intangibles data, incorporates any information that would allow the calculation of depreciation. One option to solve such a problem is to rely on an alternative data source, such as expert estimates.

Computerized information. The main source is the survey on ICT usage in enterprises. From the perspective of the intangible investment and capital study, the coverage is problematic as expenditure values can only be calculated based on combining these data with data on total employment and total number of hours worked as well as data on wages. This would allow an approximation of the estimated software development within the firm. The data on external purchases is only available as a binary (Yes/No) outcome except for industry and construction where the SBS variable on investment in

purchased software is available multi-annually. So to fully capture the expenditure values, the ICT questionnaire would have to be extended in this part or (even more challenging) gaps in years and economic activities filled through SBS. Even in the case of these data being available, the harmonized ICT survey still does not allow capturing expenditure values of databases available and developed within the companies or externally. These aspects would have to be added. But since the questionnaire on ICT usage is being conducted on a yearly basis, an extension of the survey questionnaire by several questions would represent significant value added with regards to intangible investment analysis, while keeping the additional burden imposed on firms relatively low.

Innovative property. A number of relevant elements from the component of innovative property are captured in the Community Innovation Survey, which is harmonized in the majority of EU countries. With regards to measuring innovative property, and also taking into account the measurement of intangibles in the ONS and ISTAT surveys, the overlap between the survey questions aiming at measuring expenditure on innovation activities and the Corrado *et al.* (2006) specific elements is not the best; minor changes or extensions would be needed. As said, first, a unified EU definition of intangible capital categories and methodologies to capture them would be required. Another challenge is also the breakdown of expenditure into internal (within firm cost) and external purchases. This is not clear for all innovation expenditure categories. The main problem in measuring innovative property is the lack of information that would allow the calculation of depreciation rates.

Economic competencies. The main sources to capture the three components of economic competencies (brand equity, organizational capital and firm-specific human capital) are the Community Innovation Survey and the Continuous vocational training survey. In all three cases, the main problem is the lack of depreciation rates. With regards to subcategories, the worst covered category is the category of organizational capital, where only limited categorical information is available in the CIS data. Values on certain investment types are not available, not even aggregated. The CIS questionnaire could be expanded in the category of innovation expenditure to additionally provide values on investment (estimated costs) in the organizational changes (including the breakdown into within-firm costs and external purchases). The best covered category is the firm-specific human capital, where data on investment in CVT is detailed enough to describe within-firm costs as well as external purchases. Brand equity is partially covered in CIS. Again, the overlap between the categories measured in euros (expenditure on innovation activities) and the Corrado *et al.* (2006) elements is not the best; minor changes or extensions would be needed to isolate the category of brands.

Overall, existing (mostly harmonized) surveys conducted in the EU offer a solid starting point for the study of intangible capital and methodological extensions to existing questionnaires could be made to adequately capture the relevant components with minimum additional effort to all stakeholders. As depreciation rates are missing for all components of intangible assets, it might be worthwhile to investigate whether a different data source could be used such as expert consultation.

Table 10: Possible use of existing data from surveys conducted in the EU

	Database / Survey	Problems	Recommendation
Computerized information	ICT usage in enterprises Structural business statistics data	<ul style="list-style-type: none"> - Comparability - Complete lack of information on expenditure value or only multiannual availability for some sectors - Changing survey structure - Lack of data on depreciation rates 	<ul style="list-style-type: none"> - Extending ICT questionnaire with questions on expenditure values of purchased software and databases, and internal expenditure - Adding 2 questions on depreciation period (software, databases)
Innovative property	Community Innovation Survey	<ul style="list-style-type: none"> - Lack of data on depreciation rates - Categories for which data is collected not aligned best with Corrado <i>et al.</i> (2006) definition 	<ul style="list-style-type: none"> - Harmonizing at the level of EU the intangible investment categories and extending existing surveys (CIS included) to fit the new definition while at the same time maintaining the existing categories - Adding questions on depreciation period (for each innovative property type)
Economic competencies	Community Innovation Survey Continuous Vocational Training Survey	<ul style="list-style-type: none"> - Lack of data on expenditure - Lack of data on depreciation rates 	<ul style="list-style-type: none"> - Adding organizational innovation expenditure (more clearly as a separate category) in CIS - Clearly separating brand investment in CIS and also dividing costs into external and internal

5 Conclusion

The purpose of this paper was two-fold:

- To study *ad hoc* surveys aimed at measuring intangible capital in the European area in order to see the main characteristics of their methodologies and analytical possibilities these methodologies offer given the type of data collected.
- To examine existing surveys, conducted in the EU and reported to Eurostat, to see, which components of intangible capital are already being measured and how sufficient this measurement is, especially with regards to the conceptualization of intangible capital and desired operationalization.

Overall, four different survey have been more exposed in the literature and also examined comparatively in this paper:

- 1) Imperial College Business School & ONS (2009; 2010): Investment in Intangible Assets Survey (UK).
- 2) Eurobarometer survey (2013): “Investing in Intangibles: Economic Assets and Innovation Drivers for Growth” (EU-27, Croatia, Iceland, Japan, Norway, Serbia, Switzerland, Turkey, the Former Yugoslav Republic of Macedonia and the United States).
- 3) ISFOL & ISTAT (2013): “Rilevazione statistica sugli investimenti intangibili (*in English*: Statistical survey of intangible investment)” (Italy).
- 4) Prašnikar et al. (2010-2015) survey of intangible capital in the private and public sector (Balkan countries: Slovenia, Bosnia & Herzegovina, Albania).

The comparison shows that the UK and Italian survey are quite similar, short and focused on capturing values, while Eurobarometer and primarily also Prašnikar *et al.* (2010-2015) study are broader (capturing also motivations, strategies, etc.), but due to the nature of data collected with many categorical variables less appropriate for standard econometric analysis.

In the second part, the paper examined existing survey data, collected by national statistical offices under the umbrella of Eurostat to see, whether it would be possible to use these for the study of intangible capital. The analysis shows that with a unified (EU) methodological definition of intangible investment and methodological extensions of existing questionnaires it might be possible to adequately capture the relevant components with minimum additional effort to all stakeholders.

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