Chapter 1
Methodology

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The main goal of the PACINNO project is to establish a platform for cooperation in research and innovation on the level of the Adriatic Region, with the aim of overcoming the main inhibitors to economic development. To this end, it is of crucial importance to fully understand the factors that enable and inhibit the growth and development of an innovation-friendly climate in the Region. In order to address this issue, all eight countries of the Region conducted a micro, meso and macro-level analysis of innovation in their respective countries. In-depth micro-level research has been conducted in order to fully grasp individual perspectives on innovation. Furthermore, to understand organizational perspective of innovation, meso-level research was conducted, which included two research methods: survey and action research. Finally, in order to understand macro levels of innovation in the Adriatic Region countries, two types of data were utilised: quantitative and qualitative.

Moreover, it is important to highlight that this book is a result of several country-level analyses that were collected in the form of a report. Therefore, the content is unified and follows the same structure for all eight countries of the Region.

1.1 MACRO LEVEL RESEARCH

One of the main outputs of the macro level analysis on the regional level is the creation of the Adriatic Innovation Map. In order to obtain more information on this please visit the Adriatic Innovation Map web site: www.adriaticinnovationmap.eu.

In the PACINNO project, the macroeconomic analysis of innovation enablers and inhibitors was conducted from both the qualitative and the quantitative perspectives. The quantitative analysis was used to identify and classify the macro-level enablers and inhibitors.

1.1.1 MACRO QUANTITATIVE ANALYSIS

Following the review of various empirical studies on national and regional innovation systems and screening of numerous international (EUROSTAT, World Bank, Total Economy Database, Innovation Union Scoreboard, OECD, Global Innovation Index, EU CORDIS, eCORDA, Global Entrepreneurship Monitor, SCImago) and national databases, a total of 226 innovation indicators, which can be viewed as enablers or inhibitors, were pre-selected and grouped into ten categories or "dimensions". The data were collected by all project partners during the period from July to November 2014, and were again revised and updated in October 2015.

However, it must be noted that a significant amount of data could not be collected, especially for the non-EU countries of the Adriatic Region, due to their non-availability, even from local statistics offices. In order to tackle this problem, the following selection procedure was applied: (1) if there were more than two countries' data missing for any of the observed years per variable, the variable was disregarded; (2) if there was a minimum of one year of observation with sufficient data (with not more than two missing), the variable was considered for analysis. This process resulted in 33 indicators selected for the analysis, with the data referring to the period from 2011 until 2014. Table 1.1 summarises the macro-level innovation study dimensions and relevant indicators.

Finally, due to space limitations, for the purposes of this book we have considered a total of six indicators for the analysis: GDP per capita (economic data), the number of new PhD graduates (human resources), the total number of students/tertiary education participation (education system), government expenditure on R&D in the country (public sector), business expenditure on R&D in the country (private sector) and the number of SCImago scientific journal articles (scientific output).[1]

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1   A complete list of indicators that were included in the analysis can be found in the extended version of the 6.1 report available at the www.pacinno.eu.

Table 1.1 – Innovation dimensions with selected indicators[2]

No.	Dimension	Indicators
1	Economic data	GDP per capita (in EUR)
2	Human resources	Total number of new PhD graduates (% of active population)
3	Education system	Total number of students/tertiary education population (% of active population)
4	Public sector	Government expenditure on R&D in the country (% of GDP)
5	Private sector	Business expenditure on R&D in the country (% of GDP)
6	Scientific output	Number of SCIMAGO scientific journal articles (% of active population)

The dimension of **economic data** measures some key indicators of the overall national economic situation and performance. The second dimension is oriented towards **human resources**, which play a critical role in the innovation process, as the competitive advantage built on human resources is not easily imitable. The **education system** is considered to play a central role in building innovation capacity, serving as a vehicle for transferring knowledge and earning competences. In the fourth dimension, the analysis focuses on several indicators of **public sector** commitment to the generation of new ideas. The fifth dimension represents the **private sector**, which is considered to be an engine of economic growth and job creation because of the constant upgrading and adjustments that private enterprises have to make in order to stay competitive, thus incorporating innovation and new technologies. Closely related to the innovation capacity is the **scientific output**, which is also used as an indicator of a country's innovation performance.

The data were analysed using descriptive statistics. Considering that it was not always possible to compare the data by the same year, the arithmetic mean value of the last three available years of observation was calculated for every selected variable.

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2   For more information on innovation system dimensions and indicators see PACINNO 6.1 Report on macro enablers and inhibitors available at www.pacinno.eu.

1.1.2 INNOVATION POLICIES MAPPING

In order to get a perspective on innovation policies, partners performed a search of the ERAWATCH webpages and reviewed the documents related to their countries. Based on the obtained information, a list of R&D and innovation policies for the period from 2007-2013 (coincident with the FP7 period) was created.

The second step, after the identification and description of institutions responsible for innovation policies, was the identification and description of particular innovation policies. This was also done through desk research of laws/regulations promoted by the identified policy making institutions. Researchers were encouraged to read every document carefully or even consult with the responsible bodies if necessary.

The final taxonomy of policies was developed by the joint efforts of the consortium and included the following variables:

1. Category in the taxonomy (further divided into direct (various grants) or indirect (various incentives) support:
   - R&D
   - Human Resources
   - Collaboration
   - Innovation capabilities
2. Name of the tool/measure and/or its code
3. Responsible body
4. Time span
   - Start/end years
5. Short description
6. Specific target groups (if applicable)
7. Best practice example (yes/no)

1.1.3 INTERVIEWS

In order to get a deeper insight into the innovation system and validate the results of the quantitative analysis, qualitative, semi-structured interviews with key respondents were conducted. The overall goal of the interviews was to identify policies, measures and instruments, which were evaluated as best practices or innovation enablers. Semi-structured interviews were chosen as a method for its flexibility, which enables the interviewer to pursue unexpected paths introduced by the interviewee and to encourage discussion by probing (Neergaard & Ulhoi, 2007). At the

same time, it is important to have some structure in order to enable comparison between countries. The interviews were conducted to the point of saturation, where additional interviews do not contribute to findings by giving us some new insights (Kvale, 1996).

Before conducting the rest of the interviews, researchers from every participating country conducted two pilot interviews in order to test the clarity and appropriateness of the whole interview process. An interview guide was used to lead the researchers, which was prepared on the basis of the literature review and various reports on innovation systems and policies. The interview was divided into two main sections. The first section was oriented toward the general overview of innovation measures, instruments and actors, and the second focused on best practice examples of innovation policies. The interviews were conducted from June until October 2015.

SAMPLE SELECTION

For the qualitative interviews, respondents were selected using the reference-based method. This means that the potential respondents were selected on the basis of their specific position and knowledge on the subject. In addition to the reference-based method, the **snowball (or chain sampling) method** was used. The respondents were asked to identify other relevant respondents who were then selected based on their relevance to the research (Patton, 1990).

On the level of the Adriatic Region, a total of 50 interviews were conducted. The first contact with the respondent was made via e-mail which explained the purpose of the research, why the respondents were chosen, the researcher's affiliation and the general aims of the project. In addition, an invitation letter was attached that further explained the subject of the interview and its contents.

The final sample consisted of four main groups of respondents: entrepreneurs, policy makers, academics and intermediaries.

DATA COLLECTION AND ANALYSIS

Face-to-face interviews were used to collect the data with both sides signing the consent form (Kvale, 1996; Yin, 2011). The consent form contained information about the interview, its structure and guaranteed confidentiality. Anonymity was also ensured by coding the respondents' names and affiliations in all of the interview-related materials. The research team audio-recorded the interviews and later extracted written summaries from the recorded material, which served as a basis for data analysis.

Overall, the interviews lasted for 2.743 minutes . The interviews were conducted with two researchers always present, whenever possible. One was responsible for

guiding the interview and the other for taking notes and making sure that the structure was followed and every topic covered.

The ad hoc creation of meaning method was used for the interview analysis (Kvale, 1996). This method implies that the researchers were free to choose the analysis technique depending on the research phase, level of analysis and other factors. Since the respondents came from different contexts and had different approaches to the same phenomenon, this method was estimated as the most appropriate for the analysis.

The data analysis was done using the Atlas.ti software. It was used to assign codes, code families and themes to the audio recordings and transcribed summaries. Code families were designed according to the interview structure and were later accompanied by specific codes assigned to them according to the questions from the interview structure.

1.2   MESO LEVEL RESEARCH[3]

In order to study the meso-foundations of innovation in the Adriatic Region we have conducted a survey.

1.2.1   SURVEY[4]

The Community Innovation Survey (CIS) is commonly used as the most comprehensive source of data for the analysis of innovation at the European level. CIS is formed as a complex of several different surveys that are conducted by the national statistics offices in Europe. Since this tool represents a unified research instrument, it enables direct comparisons of countries, sectors or regions. The CIS survey is also the main source of data for the Innovation Union Scoreboard (IUS). The IUS serves as a main tool for the European Commission to assess the innovation performance of the EU member countries.

Regardless of its comprehensiveness, the IUS still does not cover many countries of the Adriatic Region. In particular, it partially covers Serbia, but it does not cover Bosnia and Herzegovina, Montenegro or Albania. In order to fill this gap, the intention of the PACINNO research team was to use a comparable instrument relying heavily on the CIS structure. For the purpose of the PACINNO study, the ques-

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3   For more information regarding the meso level analysis see PACINNO 4.1 Report on micro foundations of innovation (survey on innovative companies) available at www.pacinno.eu.

4   For more information visit www.pacinno.eu.

tionnaire was developed partially using the CIS methodology and adding additional questions derived from the academic literature.

The final version of the questionnaire was comprised of 12 sections with the focus areas presented in Table 1.2.

After the first English version of the questionnaire was completed, researchers applied the back translating method, which refers to translating the questionnaire into the local languages and back into English, all using different translators, followed by correction of irregularities.

The final version of the questionnaire was posted on the Limesurvey (www.limesurvey.com) platform, hosted by the School of Economics and Business, Sarajevo (WP4 lead partner).

The survey was conducted between July 2014 and January 2015 and most questions refer to the period from 2011- 2013. The results were interpreted using descriptive statistics.

Table 1.2 – Focus areas of the meso-level analysis survey

Section	Focus
1	General information about the enterprise including its NUTS, main activity and NACE, and market presence (national, Adriatic Region and above)
2	Product (goods or services) innovation in terms of introduction of new or significantly improved goods or services, both new to the market and new to the firm
3	Process innovation of firms, defining process innovation as a new or significantly improved production process, distribution method or supporting activity
4	Factors hampering product and process innovation activities
5	Implementation of in-house R&D, external R&D and the level of spending on those activities
6	Sources of information and cooperation for product and process innovation and cooperation between firms and their potential partners
7	Organisational innovation
8	Process (administrative/marketing) innovation
9	Self-reported performance measure (compared to the most direct competitor)
10	Firmographic data
11	Social innovation
12	Market orientation

1.2.2 SAMPLING AND DATA

A stratified random sampling method was used in all countries of the Adriatic Region. This implies selecting subsets of the overall population of micro, small and medium firms and then randomly selecting a sample from those subsets. In the case of the questionnaires, subsets were selected from the innovative industries in each country. Researchers from each country decided upon the appropriate industry. For some countries, official secondary data on the most innovative industries existed, while for some they did not and the decision was made based on prior qualitative research and assessment. In case this described sampling method was not technically and objectively viable in a country, researchers were free to select another sampling method, trying to take into account the general criteria.

Following the distribution of the survey, a total of 1.165 responses were selected for analysis based on a 70% completion rate (cut-off criteria).

1.2.3 LIMITATIONS

Although all the PACINNO project partners carefully followed the sampling and data collection procedures defined at the consortium level, alternative approaches had to be taken in some countries, which was mostly due to the absence of adequate official business registries. Therefore, some caution should be exercised in interpreting the results for the whole Adriatic Region, taking into account the varieties of the samples.

1.3 MICRO LEVEL RESEARCH[5]

In-depth micro-level research was used in order to efficiently grasp individual perspectives on innovation.

The initial plan set out in the project proposal included the analysis of 16 firms, 2 per participant country. Since 20 firms were ultimately analysed, the consortium exceeded the project plan by 25% in terms of outputs. Quantitative data were collected on the level of individual employees. Statistical inference was analysed via SPSS 20 software. The research was conducted using the questionnaire instrument, which contained 14 sections and was translated using a back-translating method. The questionnaire was distributed to respondents during November and December 2014.

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5   For more information regarding the micro level analysis see PACINNO 4.2 Report on micro foundations of Innovation (in-depth multilevel analysis) available at www.pacinno.eu

Table 1.3 below presents the measured concepts in the research on individual-level innovativeness.

The data were collected from the employees for the individual level analysis, but the questionnaire also included questions about their group/team/unit belonging. Each project partner made efforts to find suitable innovative SMEs that agreed to participate in the research. The questionnaires were distributed to their employees online or in paper format. The final database comprised of 8 countries, 20 firms, 73 groups and 787 individual cases.

Table 1.3 – In-depth micro-level analysis: measured concepts from the individual-level innovativeness model

Section	Focus
1	Knowledge hiding
2	Uncertainty avoidance
3	Individualism
4	Individual innovation
5	Employee silence
6	Time pressure perception
7	Task conflict
8	Flow/motivation
9	Time perspectives
10	Cultural intelligence
11	Time management
12	Entrepreneurial intentions
13	Self-efficacy

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