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**Master Business Informatics**  
Master Thesis

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# Software in the Netherlands II

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## Public Version

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## Abstract

The software industry in the Netherlands is flourishing and plays a valuable role in the Dutch economy. It is an engine of sustainable economic growth, provides tens of thousands of jobs, is a driving force behind innovation and enables other industries to thrive. Despite this success, attention and recognition by the general public is perceived to be lacking. Governments tend to be unaware of the presence of software industries within their region, and cooperation with research and educational institutions on a regional level is often argued to be suboptimal. The regional dimension herein is paramount to get a complete understanding of the regional dynamics at play, and to understand how regional resources – that are unique to every region – shape and contribute to the distinct regional innovative and competitive atmospheres in which software firms operate. Insight into the needs, desires, opportunities and threats regional software ecosystems are confronted with concerning business, educational and governmental partnering, however, remains opaque and deficient. This thesis addresses these shortcomings by means of explorative multi-method empirical research. Multiple case studies were conducted with different stakeholders in the Dutch product software industry in three different regions to gauge the sentiment concerning regional business, educational and governmental partnering. In addition, a survey based on the annual Finnish software industry survey was created and conducted with the aim of taking stock of the Dutch product software industry, while at the same time obtaining insight into regional partnering from a broader perspective. Results reveal that the awareness of both software companies and governments on regional industrial activity and perceived benefits of partnering within regional software ecosystems is lacking. A willingness by all stakeholders to intensify regional partnering activities, however, is signaled. Based on the results of the case studies and the survey, recommendations are provided on how regional business, educational and governmental partnering within the Dutch software industry can be improved. Among the most prominent recommendations are scaling up regional networking initiatives among stakeholders in the software industry to achieve greater speaking volume and influence when dealing with governments or other external stakeholders, an intensification of industrial-educational relationships to harmonize the needs and demands of both software companies and research and educational institutions, and to organize joint sessions in which both representatives from the software industry as well as governments take place to gain common ground and mutual understanding on the opportunities and challenges facing the software industry. The findings and recommendations presented in this thesis can assist stakeholders in the Dutch product software industry in making better informed decisions concerning regional partnership management, and support the development and overall health of the Dutch software industry.

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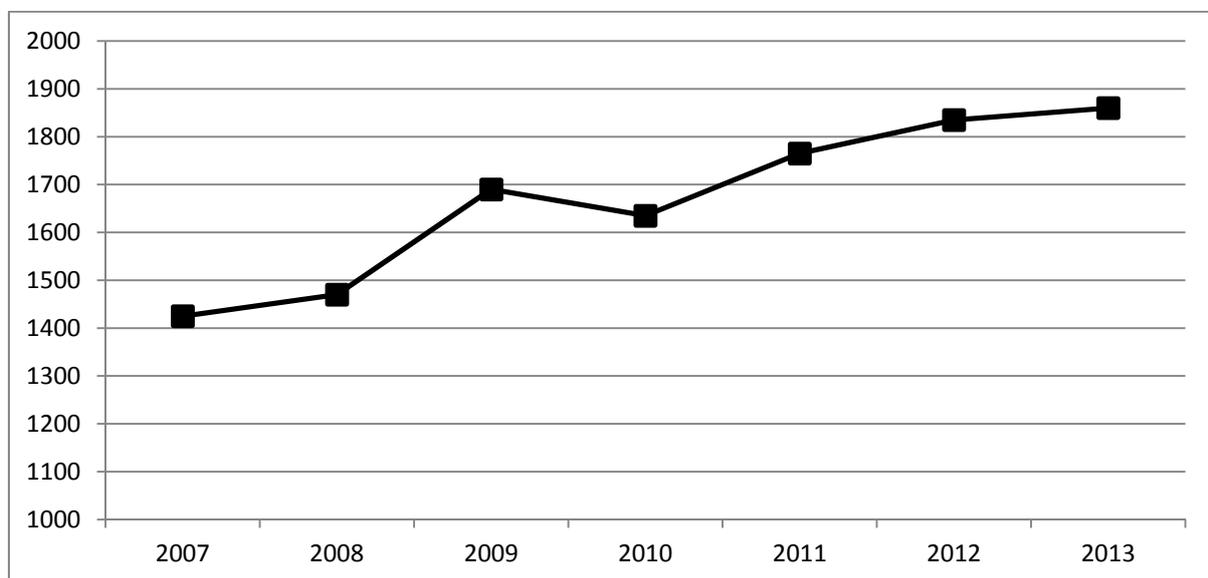
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## 1 Introduction

The software industry in the Netherlands is flourishing and plays a valuable role in the Dutch economy. In 2010, the gross value added by the software industry amounted approximately €24.3 bn. Relatively seen, this comes down to 3.9% of the Dutch gross national product (Te Velde, Veldkamp, & Plomp, 2010). When put in perspective, this means that the Dutch software industry is, according to Statistics Netherlands (Centraal Bureau voor de Statistiek), at least as big as other key strategic clusters within the Dutch economy such as agriculture and food, life sciences and the chemical industry (Centraal Bureau voor de Statistiek, 2011). The software industry in the Netherlands thus generates a significant share of the Dutch GDP as an independent sector.

In addition to this financial contribution, the Dutch software industry is also responsible for providing more than 192,000 jobs, measured in full-time equivalents during the year 2010 (Te Velde et al., 2010). When looking at the amount of IT companies classified under SBI 62 (IT-dienstverlening) in the database of Statistics Netherlands that employ at least ten employees, statistics show that this number has steadily increased over the past seven years (see Figure 1) (Centraal Bureau voor de Statistiek, 2013). When benchmarking the Dutch software industry with 23 of its European peers, the Netherlands ranked 4<sup>th</sup> in terms of the relative revenue contribution of the software industry to the Dutch GDP with 3.9%. When performing a likewise comparison concerning the number of people employed in the software industry as a percentage of the total population employed in all sectors, the Netherlands ranked 2<sup>nd</sup> out of 24 European countries with 1.7% (Te Velde et al., 2010). These numbers, coupled with the increasing relative growth rates, indicate the software industry in the Netherlands is becoming an even more prominent and fruitful sector than it already is.



**Figure 1: Number of software companies with more than 10 employees (classified under SBI 62)**

Another important observation, is that the Dutch software industry can be characterized as a research and development (R&D) intensive industry. In 2010, approximately 9% of the entire working capacity in the software industry was concerned with R&D (Te Velde et al., 2010). This is an

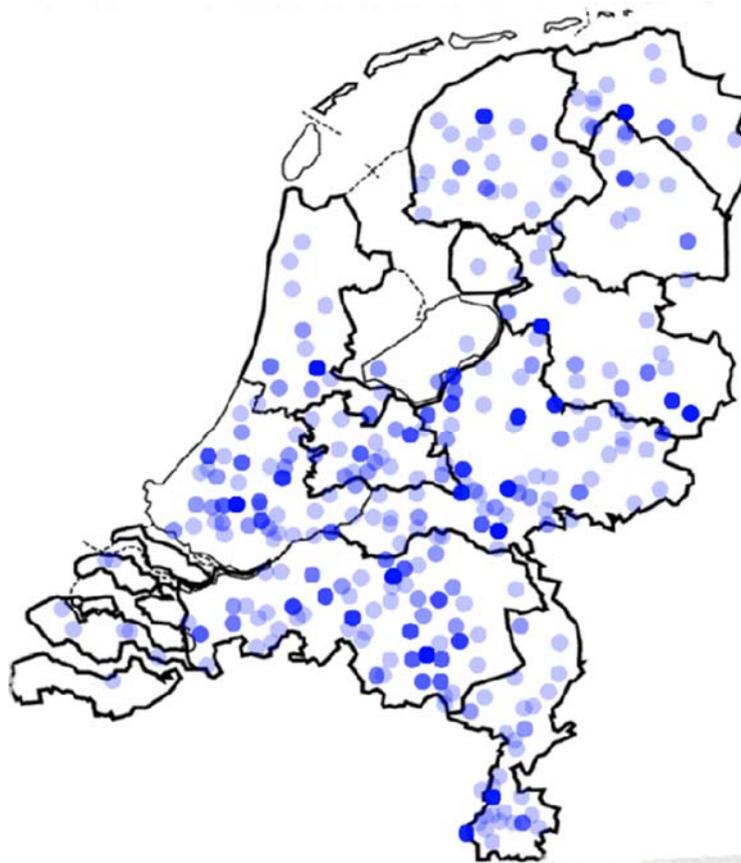
interesting notion, as the same research also showed that 23% of the total revenue of Dutch software companies can be contributed to new or improved software products. This stands in sheer contrast with other domestic industrial sectors, where the average is approximately 10% (Te Velde et al., 2010). R&D is thus a crucial element for software companies in order to grow, and to create or maintain their competitive advantage.

Taking into account that the software industry can be regarded a rapidly changing environment in which software companies are becoming increasingly interconnected and interdependent (Van Angeren, Blijleven, Jansen, & Brinkkemper, 2013), organizations more and more engage in local partnerships or become a member of a local cooperative network to achieve a wide variety of benefits. An explanation to why software companies collectively organize themselves on a local level, becomes particularly visible when studying the spatial organization of software companies throughout the Netherlands (see Figure 2). This visualization shows that concentrations of often related software companies, also called clusters or regional ecosystems, are primarily found surrounding universities, large software companies and at the borderline between the provinces of Utrecht and Gelderland (the latter being numerous spin-offs as a result of the former Baan-imperium) (Te Velde, Veldkamp & Plomp, 2010).

Considering the expertise and specialized knowledge possessed by software companies within regional ecosystems are often mutually beneficial due to the related nature of the produced goods or services offered, software companies frequently organize themselves in dedicated cooperative networks. Such networks represent the interests of their members by various means. Examples are facilitating the creation and exchange of new knowledge driving R&D that is pivotal for sparking innovation (Hekkert, Suurs, Negro, Kuhlmann, & Smits, 2007), extending sales channels by providing access to a larger potential customer base, facilitating joint research initiatives to share R&D costs and benefits, and to have greater speaking volume when negotiating with the government – for instance about support during internationalization trajectories or economic downturns. Examples of such dedicated local cooperative networks are CoopFoodValley ([SNIP]) in the region Veenendaal-Ede-Wageningen (also called the Food Valley), or CoopUtrecht ([SNIP]), an organization that supports networking between software companies and other stakeholders in the region Utrecht.

Despite cooperative networks attracting participants with resulting success, **both provincial and local governmental institutions are not always aware of the presence of such regional ecosystems of successful (knowledge-intensive) software companies within their region.** This is not solely odd considering software companies generate a significant share of the total revenue within such regions and generate many jobs, but also because the government is able to play a facilitating role to both directly as well as indirectly support the industry. Direct governmental support for instance, encompasses supporting clusters of software companies in attracting and retaining new talent, monitoring the health of the local or regional ecosystem and undertake action accordingly, or to stimulate innovation by supporting the creation and diffusion of essential knowledge between software companies within their region. Amin (1999) mentions more of such direct stimuli, among which are facilitating inter-firm exchange and reciprocity through buyer-supplier linkage programs, incentives for pooling of resources, joint ventures, and task specializations. Examples of indirect stimuli that often have effect on the long run, are creating or adapting existing relevant policies to

ensure that jobs are being maintained during economic downturns, and aiding niche creation and spin-offs that generate new jobs (Frenken, Van Oort, & Verburg, 2007). In sum, both direct and indirect governmental support offer plenty of opportunities.



**Figure 2: Spatial organization of software companies in the Netherlands (redrawn from Te Velde, Veldkamp & Plomp (2010)).**

At present, insight into the current state of the software industry with regard to why and in what way software companies organize themselves in regions with resulting consequences, remains largely unknown. The first objective of this thesis was therefore to capture this aforesaid insight by means of focused literature studies on the topics of the formation of regional ecosystems, regional development and innovation, and evolutionary economics and dynamics, which led to the creation of a theoretical background upon which this research project is based. Identifying and exploring the desired role the government could fulfill according to software companies, cooperative networks, and governmental representatives themselves with regard to supporting regional software ecosystems, was the second objective of this thesis. The third objective, in turn, was to identify the triggers behind knowledge sharing and technical partnerships between organizations and public research institutions, that are considered key drivers for (regional) innovation. As a consequence, this research project was primarily carried out by means of conducting multiple case studies with the aforementioned different stakeholders. This led to insight about the current state of the industry, as well as perceived strengths, weaknesses, opportunities and threats as experienced from various

stakeholder perspectives concerning the role the government fulfills to support the software industry. In addition, it also provided insight into motives behind knowledge sharing and technical partnerships among organizations and with public research institutions, and the way in which this takes place.

A fourth objective of this thesis, based on the results from the aforementioned three objectives, was to produce and analyze the outcome of a newly designed annual software industry survey. This survey is based on the data gathered from the focused literature studies and case studies. A similar annual software industry survey in Finland has been held since its introduction in 1997, providing Finnish researchers and practitioners with an annual overview of the current state of the software industry in Finland (<http://www.softwareindustrysurvey.fi/>). This survey is also the longest running software industry survey in the world with its 15<sup>th</sup> anniversary just celebrated in 2012. The data resulting from this survey proved to be a valuable source to support researchers and practitioners in drawing conclusions about the industry, and to undertake actions or create and adapt government policies accordingly. Due to the success and its resulting recognition of the Finnish annual software industry survey, it has now also found its way to Germany where it is conducted by the Technical University of Darmstadt (<http://www.softwareindustrysurvey.de/en>), and Austria, where it is conducted by the Fraunhofer Institute (<http://www.softwareindustrysurvey.org/node/62.html>). Despite the aforementioned size, growth and opportunities of the Dutch software industry, attention and recognition by the government for regional software ecosystems was hitherto perceived to be lacking. A survey as described was therefore perceived to be of tremendous value to formulate concrete recommendations on how to improve the current state of the Dutch product software industry regarding governmental support, and to let the Dutch product software industry earn its recognition from the government and related stakeholders that it deserves.

## 1.1 Relevance

### 1.1.1 Scientific Relevance

Identifying the current state of the Dutch product software industry concerning business, educational and governmental partnering within regional software ecosystems, including the desired role the government could fulfill according to software companies, cooperative networks and governmental representatives to support regional software ecosystems, brings along a wealth of scientific research opportunities. First, gaining insight into the current problems and opportunities experienced by the aforementioned stakeholders can serve as **a basis for a future research agenda** to be formulated by experts. This research agenda can then steer researchers in what direction research should be conducted, and how practitioners (e.g. software companies and policymakers) can undertake actions accordingly – eventually leading to growth and augmented health of regional software industries.

Second, understanding how and in what way economic actors (such as software companies) organize themselves in regions with resulting consequences, understanding and being able to clarify manifestations of said consequences, and understanding spatial organizations of economic activities within regions, can **aid researchers in analyzing the organization of (regional) software industries**

**from a new perspective.** Examples of relevant subjects to be investigated from an **economic geographical perspective** are regional innovation mechanisms, innovation systems, and evolutionary economic theories.

Third, **knowledge of manifestations of interest (e.g. regional partnering preferences and initiatives) is a key prerequisite for making rigorous statistics.** Experience of different stakeholders gathered during case study interviews serves as the **theoretical foundation upon which the product software industry survey will be built.** This theoretical foundation may also be used for other types of related research projects in the future, such as studies investigating the value educational institutions offer to the region in which they are located.

Fourth, benchmarking the domestic software industry by means of an annual survey allows researchers to **get a bigger picture of how the structure and composition of the software industry itself is changing over time.** Apart from acquiring this bigger picture, the results from an annual software industry survey can serve as a **large data source upon which a multitude of research can be built,** which can currently be observed in Finland. Data collected from the annual Finnish software industry survey is commonly used to **expose points of opportunity or threats concerning the industry.** An example of the latter is measuring the impact Nokia's decline has on the Finnish software industry to estimate the economic consequences for e.g. niche creators, and to determine the societal impact of large-scale lay-offs and knowledge drains. Based upon such identified opportunities or threats, research can be conducted accordingly to find a solution. This will eventually lead to practical implications, again in turn leading to **growth and a healthier industry.** Examples of studies based on the results of the Finnish software industry survey are measuring and comparing the adoption of software process practices in the product software industry (Rönkkö, Järvi, & Mäkelä, 2008), the creation of a model for the main factors of influence concerning marketing and selling Software-as-a-Service (SaaS) (Tyrväinen & Selin, 2011), studying internationalization trajectories of Finnish software companies (Rönkkö & Peltonen, 2010), and providing a definition for SaaS by means of a large empirical study of Finnish SaaS providers (Mäkilä, Järvi, Rönkkö, & Nissilä, 2010).

### 1.1.2 Practical Relevance

The practical relevance of this research is manifold. First, the analysis of the results of the case studies conducted with multiple stakeholders and the survey organized, provides **insight into what direction software companies, educational institutions and governments should be heading** to strengthen and support regional software ecosystems by means of recommendations. Examples of initiatives to stimulate regional software industries are **stimulating market demand** by bringing software vendors and complementary industries together, **providing education programs of outstanding quality that match with demands from the industry** and can be flexibly adapted accordingly, and **creating or reshaping (existing) policies and regulation** to e.g. **stimulate the development and diffusion of new knowledge** that is considered pivotal in an R&D-intensive sector – especially to spark innovation (Hekkert et al., 2007).

Second, the annual software industry survey conducted in Finland has already yielded great benefits for both researchers and practitioners. So far, the surveys conducted have provided practitioners in Finland with an **accurate view of the needs and challenges** that organizations face on their journey to international growth. In addition, the results provide an **opportunity for software vendors to benchmark themselves** against other companies in the industry. Despite the relatively low response rate to the Dutch product software industry survey, several overarching needs and challenges became apparent.

Third, the results of the annual product software industry survey, when conducted over multiple years, can be used as part of a **presentation or background material for several Dutch delegations abroad**, for instance when pursuing potential foreign investors or customers. The same holds for the availability of such background material to various media to emphasize the value of the Finnish software industry. These opportunities for exposure have become an interesting externality of the Finnish software industry survey and so far have been paired with great success.

Finally, akin to the situation in Finland, the survey also **provides insight in strategic areas of improvement concerning governmental support**, such as securing the supply of a well-educated labor force, developing market sales know-how, promotion of networking and exploitation of social capital in companies, supporting ‘productization’ and increasing support during internationalization trajectories facilitating growth and the overall health of the software industry.

## 1.2 Contributions and Document Structure

The remainder of this thesis continues with the introduction and accompanying descriptions of the research questions central to this research project in Section 2, followed by an elaboration upon how these research questions were answered by means of a detailed research approach – including the research steps taken and their deliverables – in Section 3. Section 4 provides an overview of the theories derived from the focused literature studies conducted upon which this research project is built. The results of the case studies conducted are presented in Section 5, followed by a description of the survey results in Section 6. The recommendations based on the results of the focused literature studies, case studies and the survey are presented in Section 7. A discussion of this research project that addresses threats to validity and suggestions for future research is provided in Section 8. Finally, Section 9 concludes this research project by summarizing the main content presented in this thesis, as well as by providing answers to the research questions that initiated this research project.

## 2 Research Questions

This section will introduce the research questions that drove this research project, accompanied with the objectives and underlying research approach. The objective of this thesis was threefold. First, *gaining insight into the current state of the software industry with respect to how and in what way software companies organize themselves in regions with resulting consequences* was required in order to form a theoretical background for this research. Second, *identifying the current perception software companies and cooperative networks have regarding business, educational and governmental partnering within regional software ecosystems* was investigated by means of multiple case studies with software companies, cooperative networks and governmental representatives. Third, based on the two aforementioned objectives, a domestic product software industry survey was constructed. Afterwards, an in-depth analysis was conducted on the results of this survey, with an emphasis on organizational characteristics of the survey respondents, as well as their perceived importance concerning business, educational and governmental partnering regional software ecosystems, and how this could be improved.

Based on the aforementioned objectives of this research, the following main research question was defined for this research project: ***“What is the current state of the Dutch product software industry concerning business, educational and governmental partnering within regional software ecosystems, and how can this be improved?”***

### 2.1 Sub-Research Questions

Before an answer can be formulated to the main research question, it was pivotal to acquire prerequisite knowledge on the topics of economic geography and regional economics. This gave insight in how and in what way economic actors (such as organizations) organize themselves in regions with resulting consequences, to understand and clarify manifestations of said consequences, and to understand spatial organizations of economic activities within regions. The first sub research question was therefore:

- 1 *Why and in what way do economic actors organize themselves within regions, and what theories are available to understand and clarify manifestations of such spatial organizations?*

Afterwards, it was essential to get an understanding of the current state of the software industry. This understanding was initially based on existing literature, primarily by means of studying governmental reports, consultancy reports and, if available, scientific peer-reviewed publications. The second sub research question was thus been formulated as follows:

- 2 *What do findings presented in existing literature tell us about the state of the Dutch software industry?*

As soon as sub research question 2 was answered, an analysis of the Finnish annual software industry survey was conducted to distill a common set of questions that are also applicable to the Dutch product software industry. Such general questions involve asking survey participants about e.g. their delivery model(s), business model(s), type(s) of products offered, growth expectancies, and so forth. The third sub research question formulated was therefore:

- 3 *What general elements addressed in the annual Finnish software industry survey are also applicable for a Dutch software industry survey, and can be used accordingly?*

After this common set of questions was distilled, case studies by means of interviews were conducted with various stakeholders to define specific questions (oriented at business, educational and governmental partnering in regional software industries) that were included in the survey. The aim of these case studies was to uncover the current perception software companies and cooperative networks have with regard to the role the government fulfills at this moment, or could fulfill to support regional software ecosystems. As aforementioned, this information was then used as input for more specific questions addressed in the Dutch software industry survey. Therefore, the fourth sub research question formulated was:

- 4 *What is the current perception of software companies and cooperative networks regarding business, educational and governmental partnering within regional software ecosystems, and how can this be improved?*

After case studies were conducted at software companies and cooperative networks, governmental representatives were interviewed in order to get their view on supporting regional software ecosystems, and to get their vision on in which direction the government should be heading in the future. It is important to notice that the results from sub research question 4 were used as input for the case studies with the governmental representatives. The fifth sub research question formulated was therefore as follows:

- 5 *What is the current perception of governmental representatives regarding the product software industry and the role the government fulfills herein, or could fulfill to support regional software ecosystems?*

As soon as sub research questions 4 and 5 were answered (even though not all case studies were conducted yet at that moment due to time constraints), the Dutch product software industry survey was finished by formulating questions based on information gathered during case studies conducted. After the survey was finalized and checked on scientific rigor by a steering group consisting of academics and multiple experts, invitations to take part in the survey were sent to a selected group of potential respondents. As soon as all case studies were conducted and the timeframe set (approximately two months) during which respondents were able to fill out the survey, the survey was closed and the results were processed. Initial findings were analyzed and enfolded with literature to compare the results of the survey with results from the case studies and, if available, similar studies as described in existing literature to find commonalities or differences (see sub research questions 1 and 2). Based on an extensive analysis of the results of the focused literature

studies, case studies and the survey, recommendations were formulated on how (and why) business, educational and governmental partnering within regional software ecosystems can be improved. As a consequence, the sixth sub research question formulated was:

- 6 *What recommendations with regard to improving business, educational and governmental partnering within regional software ecosystems can be formulated, based on findings from the survey?*

When all six sub research questions as formulated above were answered, a concrete answer to the main research question could be formulated. A description of how the research questions listed above were answered, is presented in Section 3.

### 3 Research Approach

In this section we elaborate upon the research approach employed. Section 3.1 describes the focused literature studies conducted, followed by a description of empirical and statistical evidence gathered by means of case studies and a survey in Section 3.2. A description of the way in which the data was analyzed, is elaborated upon in Section 3.3. A high-level overview of the research steps taken in order to answer the research questions driving this research is provided in Section 3.4. Finally, Section 3.5 discusses threats with regard to the validity of this research.

#### 3.1 Focused Literature Studies

Focused literature studies were conducted in order to shape a theoretical background upon which this research could be built. Focused literature studies were chosen as this was found to be most suitable in answering the research questions. Contrary to a systematic literature review, a focused literature review aids in selecting only those papers that have direct relevance to this research, rather than providing an exhaustive summary of scientific literature available relevant to the research questions addressed. As aforementioned, the primary reason focused literature studies were conducted, was to obtain prerequisite knowledge on the topics of economic geography and regional economics. This was paramount, as understanding how and in what way economic actors (such as software companies) organize themselves in regions with resulting consequences, understanding and clarifying manifestations of said consequences, and understanding spatial organizations of economic activities within regions, is central to this research project.

To gather relevant papers, books and articles, both automated and manual searches were performed. Automated searches were performed with Google Scholar (<http://scholar.google.com/>). In addition, manual searches were performed on academic networking portals such as Mendeley (<http://www.mendeley.com/>) and Academia.edu (<http://www.academia.edu/>) to include papers that were not included during the automated search. For the automated search, the following most prominent keywords were combined into various search strings:

**Keywords:** innovation, economics, software, networks, government, knowledge, spillover, spinoff, growth, decline, benchmark, survey, industry, mechanisms, regional, local, geographical, evolutionary, systems, benefits, insight, bounded, theory, survey, empirical, competitive, support, attract, evidence.

A key aspect of conducting literature reviews, is to predefine inclusion and exclusion criteria for the studies found through both automated and manual searches. The following inclusion and exclusion criteria were defined accordingly for *scientific literature*:

- 1 Studies are written in English
- 2 Studies are peer-reviewed
- 3 Studies are included regardless of their publication date
- 4 Studies that are inaccessible (beyond abstract) are not included

Since Dutch governmental and consultancy reports are often written in Dutch and are usually tailored to specific (historical) events or years, other inclusion and exclusion criteria for such sources were defined:

- 1 Studies are written either in English or Dutch
- 2 Studies that have been published before the year 2002 are not included
- 3 Studies that are inaccessible are not included

Scientific papers that met the aforementioned criteria were considered for inclusion based on their title, keywords and abstract. Governmental and consultancy reports were scanned in order to check for direct relevance to this research. Furthermore, the bibliographies of studies of both types of literature were also investigated (i.e. snowballing technique) in order to include additional relevant studies that were not included during the initial search. Although self-evident, it should be pointed out that additional searches were performed as the research project progressed. This was primarily done to unfold and validate the results gathered during the case studies and the survey, and to search for relevant recommendations made in similar studies on how to improve the effectiveness of business, educational and governmental partnering within regional software industries.

## **3.2 Empirical Studies**

The empirical foundation of this research was built on case studies and a domestic product software industry survey. This subsection addresses these empirical studies to provide chronological insight into their design, the way they were carried out and how the data was analyzed.

### **3.2.1 Case Study Research**

Multiple case studies were first conducted in order to gain insight into the needs, desires, opportunities and threats with regard to regional business, educational and governmental partnering as experienced by software companies, cooperative networks, and governmental representatives within the Dutch software industry. The choice for a multiple case study design was made to allow for more diverse input and multiple sources of evidence. At first, software companies and cooperative networks were selected to participate in this research. Afterwards, governmental representatives were selected in line with the aforementioned order of sub research questions (see Section 2). After the case studies were conducted, a domestic software industry survey was designed and organized of which the questions are based on the data gathered from the case studies. The following sub sections will chronologically address the activities conducted with regard to the case studies performed.

### 3.2.1.1 Case Study Selection

A strict case study selection process was adhered to while selecting case study participants, to ensure that the to-be selected case study participants are representative enough for the industry while at the same time being as diverse as possible. This is paramount to ensure both reliability and external validity, the latter being the degree to which the results of this case study research can be generalized (Yin, 2008). In total, five case studies by means of interviews were held with representatives from software companies, three interviews were held with representatives of cooperative networks, and three interviews were held with governmental representatives. It should be noted that three regions were studied during this research, being the regions Utrecht, Veenendaal-Ede-Wageningen (Food Valley), and the region Delft. In addition, it is also important to notice that governmental representatives were specifically chosen based on their location, that had to be the same as where the selected software companies and cooperative networks that participated in this research are located.

With regard to selecting candidate software companies willing to participate in this research, the following selection criteria were formulated:

- 1 *The software company has to produce product software.*

Since this research project has its focus on the product software industry in the Netherlands, software companies to participate in this research were selected based on the 'nature' of their software produced. Software companies solely producing e.g. embedded or tailor-made software were thus excluded from this research.

- 2 *The software company has at least 10 employees.*

This research project is primarily oriented at small to medium and large enterprises, as these companies are usually more active in e.g. knowledge sharing, take part in cooperative initiatives, and have more information available on a wider range of topics (e.g. finding well-educated employees, maintain relationship with the government) than companies with less (<10) employees.

- 3 *The software company has to be located in one of the regions designated for this research.*

For this research, the regions Utrecht, Veenendaal-Ede-Wageningen (Food Valley) and Delft were designated as the target areas where the case studies were conducted. As a consequence, candidate software companies had to be located in one of the aforementioned regions.

In addition, with regard to selecting cooperative networks willing to participate in this research, the following selection criteria were formulated:

- 1 *The cooperative network has at least 10 members producing product software.*

This criteria ensured that cooperative networks interviewed are, and have been able to exert influence over the development of a local software industry. As a result, only cooperative networks that are able to maintain relatively strong ties with the government and their members were selected.

2 *The cooperative network has a history of activities.*

Gathering experiences concerning points of opportunity or threats concerning local software industries, was paramount to the success of this research. Therefore, the cooperative network had to have a record of historical activities that could demonstrate its influence over time.

3 *The cooperative network has to be located in one of the regions designated for this research.*

As already described as a selection criterion for potential software companies, the regions Utrecht, Veenendaal-Ede-Wageningen (Food Valley) and Delft were designated as the target areas where the case studies were to be conducted. As a consequence, candidate cooperative networks had to be located in one of the aforementioned regions.

Finally, no specific selection criteria were formulated for governmental representatives, as these people are generally elected into their positions (e.g. deputies or aldermen). Evidently, the governmental representatives had to bear responsibility for the regions in which the software companies and cooperative networks interviewed for this research were located.

### **3.2.1.2 Case Study Protocol Design**

When conducting multiple case studies, the creation of a case study protocol is considered essential (Yin, 2003). A case study protocol ensures that all necessary research steps and measurements are predefined, meaning a similar approach is taken when conducting each individual case study. In addition, a case study protocol also forced us to specify in detail how we intended to find answers to the formulated research questions, and that when circumstances would change, it would be easier to adapt a formal case study protocol rather than one that is informal and ill-defined. As a consequence, internal validity, external validity and construct validity are enhanced, as well as the reliability of the findings resulting from this research. Brereton, Kitchenham, Budgen, and Li (2008) developed a case study protocol template based on basic and renowned case study methods described by Eisenhardt (1989), Stake (1995) and Yin (2003) to provide researchers with a common structure for case study protocols and guidance on constructing them. In summary, Eisenhardt (1989) developed a case study method with the aim to develop theories. Stake (1995) takes an interpretive approach to case study research akin to Eisenhardt (1989), but has a focus on evaluating programs involving social and education policies. Yin (2003), in turn, takes a somewhat more positivist approach to conducting case studies, as the author recommends the use of hypotheses and/or propositions.

For this research, we are primarily interested in understanding and evaluating the current state of affairs concerning business, educational and governmental partnering within regional ecosystems, and to see how this could be improved. In addition, we also studied interactions between stakeholders in regional ecosystems by making use of a regional innovation system approach. As such, the goals of our case studies were more in line with the case study research method described by Yin (2003) that also places emphasis on consulting literature, contrary to the method described by Eisenhardt (1989). In addition, like Stake (1995), we were also concerned with evaluating a state of affairs, although we were not specifically oriented at evaluating programs. Based on these research goals, the template provided by Brereton et al. (2008) was found most suitable that is based primarily on the work of Yin (2003), while at the same time incorporating ideas from the other aforementioned case study research methods. The case study protocol as used throughout this research can be found in Appendix A. The case study protocols were checked on scientific rigor by multiple academics and experts, as well as assessed by means of checklists provided by Runeson and Höst (2009).

### **3.2.1.3 Case Study Data Collection**

The data collection process at all three types of case study participants (software companies, cooperative networks and governmental representatives) commenced with a study of available information (document study) concerning the case study participants. This information was generally available on the website of the case study participants. This first step was required to possess enough background information before actually conducting the interviews. Relevant information included, for example, the purpose, history, size and activities of the organizations and interviewees where applicable.

After having collected and studied the aforementioned information concerning the case study participants, the interviews with the selected participants took place. The aim of these interviews was to first evaluate preliminary findings from the information gathered in advance, to verify their accuracy in order to enhance validity and reliability of the findings. Afterwards, the interview proceeded according to a created semi-structured interview protocol. This semi-structured protocol based on the work of Brereton et al. (2008) and Yin (2003) facilitated in having a standardized interview protocol enhancing internal validity and reliability, while still remaining a degree of flexibility to adapt to situational interests in an ad-hoc manner. Evidently, separate interview protocols were created for the different types of interviews conducted based on the nature of the representatives (software companies, cooperative networks and governmental representatives).

Every interview was recorded and transcribed where needed, and stored in a case study database to create and maintain a chain of evidence (Yin, 2003). Maintaining this chain of evidence increased the reliability of the information gathered during case studies. In addition, to enhance the validity of this research, the aforementioned case study processes were performed in accordance with general case study research guidelines as defined by Yin (2003).

### 3.2.2 Survey Research

After the literature studies were conducted during the initial phase of this research, an analysis of the Finnish annual software industry survey was conducted to distill a common set of questions that are also applicable to the Dutch product software industry. Such general questions involve asking survey participants about, for instance, their delivery model(s), business model(s), type(s) of products offered and growth expectancies. After this common set of questions was distilled, the aforementioned case studies by means of interviews were conducted with various stakeholders (see Section 3.2.1). The results of the conducted case studies aided in formulating tailored survey questions oriented at business, educational and governmental partnering that were eventually included in the survey.

#### 3.2.2.1 Survey Design

The survey was designed around six specific topics, that addressed (1) general information about the participant, (2) the business model(s) and organizational structure of the participant, (3) regional government relations, (4) relations with regional educational institutions, (5) information about regional partnering, and (6) information about the individual respondent who participated in the survey.

- 1 General Information:** the first set of questions were largely derived from multiple editions of the Finnish Software Industry Survey, with the aim of gathering generic information about the participant such as the type of software firm, revenue distribution, location, fiscal results, amount of employees and founding year.
- 2 Business Models & Organization:** in-depth information about the participant such as growth expectancies and strategies, markets in which the participant is active, third party software platforms for which software was developed, the amount of different software products offered and the functional distribution of employees was required to make an attempt to create an overview of the Dutch product software industry. In addition, such information allows for categorization and stratification of the survey participants, to for instance compare whether large firms (100 or more employees) allocate more employees on marketing and/or sales activities than medium-sized (25-99 employees) software firms.
- 3 Regional Government Relations:** one of the components of the main research question of this research project, is to analyze what the current state of the role of the regional governments is with regard to supporting the software industry and how this could be improved. The survey participants were therefore asked multiple questions on how important various types of stakeholders (including governments) are to their organization, what regional government activities they take part in, and to what extent they agree or disagree with multiple statements about governmental involvement in the software industry.

**4 Regional Educational Institutions:** another component of the main research question was to analyze what the current state is of partnering among software companies and research and educational institutions such as universities, and how this could be improved. The survey participants were therefore asked multiple questions on what kind of activities they organize or take part in related to educational institutions, and to what extent they agree or disagree with multiple statements about the influence research and educational institutions have on their organization.

**5 Regional Partnering:** the last part of the main research question aimed to uncover how important regional partnering in the software industry is, and whether or not software firms experience regional partnering to be of added value. The survey participants were therefore asked multiple questions about what kind of regional partnering activities they value and take part in, and to what extent they agree or disagree with multiple statements about e.g. the added value of regional partnering and the influence of geographical proximity between partners.

**6 Information About Informant:** finally, the last part of the survey was aimed at the employee who filled out the survey. For instance, participants were asked on what level they operate within their organization (e.g. management team or middle management). In addition, participants were also able to indicate whether or not they would like to receive a copy of the results of the survey. Participants were also given the opportunity to provide feedback to either improve the survey or to support the software industry.

Furthermore, various initiatives were undertaken to enhance the validity of the survey. First, a steering committee, chaired by Sjaak Brinkkemper, was assembled that consisted of senior representatives from multiple research institutions. Among the participating research institutions were Utrecht University, TNO and Dialogic. An online session was organized during which attendees were able to discuss and comment on the draft survey. This led to the addition, removal and alteration of multiple questions. Second, various online meetings similar to the ones held with the steering committee were organized with Aalto University, Finland and the Technical University of Darmstadt, Germany. Since a large part of the survey was derived from the Finnish Software Industry Survey and the German Software Industry Survey, respectively conducted by Aalto University and the Technical University of Darmstadt, attempts were made to harmonize and standardize the survey questions to increase comparability between the surveys. The latter will also allow Finland, Germany and the Netherlands to benchmark the results of the survey in the future to look for interesting similarities and differences.

### 3.2.2.2 Survey Participant Selection Criteria

With regard to invitations sent to software companies with the request to participate in the survey, multiple survey participant selection criteria were defined to enhance the validity of this research project. The following selection criteria were formulated:

1 *The software company has to produce at least one software product.*

Since this research project has its focus on the product software industry in the Netherlands, software companies to participate in this research were selected based on the 'nature' of their business activities and software produced. Software companies solely producing e.g. embedded or tailor-made software were thus excluded from the survey.

2 *The software company has at least 5 employees.*

This research is primarily oriented at small to medium enterprises, as these companies are usually more active in e.g. knowledge sharing, taking part in cooperative initiatives, and have more information available on a wider range of topics (e.g. finding well-educated employees, maintaining a formal or informal relationship with the government) than those with less (<10) employees.

3 *The software company has its headquarters located in the Netherlands.*

Since this research project is specifically oriented at assessing organizational aspects such as financial forecasts, FTE employed, and partnering activities within regional software ecosystems in the Netherlands, companies with their headquarters located in a foreign country were excluded from participation. Including the total revenue generated by foreign software companies into the dataset, for instance, would lead to inaccurate results and conclusions about the Dutch software industry due to e.g. differences in operating profits and percentages of revenue coming from international markets (in this sense, the Netherlands is regarded as an international market to a foreign software firm).

### 3.2.2.3 Survey Invitations & Promotion

In order to get as many respondents as possible with the aim of assessing and analyzing organizational characteristics and regional business, educational and governmental partnering activities in regional software ecosystems, the survey was promoted to notify and attract as many software firms as possible (that met the survey participant selection criteria). Various initiatives were undertaken to promote the survey, among which are:

- 1 **Dutch Product Software Conference 2013:** the survey went officially live during the opening speech by Sjaak Brinkkemper at the first edition of the Dutch Product Software Conference 2013 organized in Zeist, the Netherlands. Representatives from more than one hundred Dutch product software companies were present during this conference. Attendees were also offered a letter with a description of the research project including a link to the survey (<http://www.softwareinederland.nl/>).
- 2 **Contact information data mining and invitations:** since no pre-existing database with contact information was available, manual searches were performed on websites such as

<http://www.softwaregids.nl/> and <http://www.softwarepakketten.nl/>. These websites maintain company information about product software vendors and their products, including contact details. This manual data mining process resulted in a list of contact details of 304 software companies. After applying the survey participant selection criteria, 174 companies were found suitable to participate. Each of those 174 software companies received a personalized email with a link to the online survey.

- 3 **Cooperative networks:** representatives of the cooperative networks with whom the case study interviews were conducted, were asked to announce the survey to the members of their network. One cooperative network offered to include an announcement of the survey in the monthly mails sent to all members. In addition, the same cooperative network also offered to place a banner (made on request) on the website containing a link to the online survey.
- 4 **Press coverage:** the AutomatiseringGids (<http://www.automatiseringgids.nl/>) supported the research project by writing a press article about it. The article provides an explanation of the research project, including an announcement of the survey and a link to where it can be accessed. The article can be found at the following web address: <http://www.automatiseringgids.nl/nieuws/2013/17/it-ecosystemen-onder-de-loep>
- 5 **Steering committee:** the steering committee that consisted of senior representatives from multiple research institutions (Utrecht University, TNO and Dialogic) were asked to spread word about the survey to their own audience and contacts.
- 6 **LinkedIn groups and personal contacts:** the survey (including a link) was announced in multiple LinkedIn groups that are primarily oriented at practitioners in the software industry. Examples are the official group of the Software~VOC and a group dedicated to software product managers. In addition, personal contacts were also contacted by means of personalized emails with a request to fill out the survey.

### 3.3 Data Analysis

The first part of data gathered could be analyzed after the literature studies and all the case studies were conducted. Again, the data analysis process was performed in accordance with guidelines as defined by Yin (2003). When analyzing case study data, Yin (2003) describes various strategies or techniques that can be applied. Key to these strategies or techniques, is to pay attention to all evidence, to display and present the evidence separate from any interpretation, and to show adequate concern for exploring alternative interpretations.

The first goal of analyzing the case studies was to formulate sets of questions related to business, educational and governmental partnering that were to be included in the survey. This led to general conclusions that had to fit each of the individual cases, even though the cases varied in their details (Yin, 2003). The data analysis technique that was found to be most suitable to analyze the results of

multiple case studies, was the **cross-case synthesis technique** (Yin, 2003). This technique treats each individual case study as a separate study, eventually resulting in the aforementioned general conclusions based on the entire series of individual case studies. It is important to notice that each case study category (depending on the type of stakeholder) was analyzed separately.

In addition to the cross-case synthesis technique, Yin (2003) also elaborates on four principles underlying good case study research, that we adhered to while performing this research. First, the analysis had to **show that attention was paid to all the evidence gathered**. This means that the analysis shows how it sought as much relevant evidence as was available, and interpretations for all this evidence should leave no loose ends. Without this standard, the analysis would have been vulnerable to alternative interpretations, undermining the reliability and external validity of the outcomes of this research project.

Second, the analysis had to **address all major rival interpretations**. That is, all potential alternative explanations for one or more of the findings to be presented in this research had to be addressed, in order to reduce the amount of ambiguity to a minimal level. Third, the analysis had to **address the most significant aspect of the case studies**. By avoiding a detour to a lesser issue, the analysis of this research is less vulnerable to the possibility that the main issue was being avoided because of possibly negative findings during the case studies.

Fourth, **own prior, expert knowledge was applied to demonstrate awareness of current thinking and discourse about the case study topic**. This was partially achieved by means of enfolding the results of the aforementioned focused literature studies around the case study results. This included comparing the results of the case studies conducted with, if available, similar studies as described in existing literature to find commonalities and differences.

After the results of the case studies were analyzed in accordance with guidelines as defined by Yin (2003), the survey was constructed as described in Section 3.2.2. As soon as the survey was closed, the data was loaded into IBM SPSS to perform initial scan on the data set. Multiple checks were performed to investigate whether any invalid or incomplete responses were given to the questions posed, in order to enhance the reliability of the survey results. Afterwards, the data from the survey was interpreted analyzed by making use of IBM SPSS, and later on coupled with the results of the case study analysis to look for similarities and differences. In addition, the survey data was also enfolding with literature based on the results of the literature studies performed at the beginning of this research project. As a consequence, based on the complete data analysis, concrete findings and recommendations on how to improve governmental support for regional software ecosystems could be given. These findings and recommendations were then be communicated to all stakeholders of this research project (including all those who participated in this research) by means of a separate report and one or multiple scientific publications.

## 3.4 Overview

This section provides a high-level overview of the research steps that were taken in order to answer the research questions as formulated in Section 2. An overview of all the consecutive activities conducted during this thesis project, including their corresponding deliverables, is shown by means of a process-deliverable diagram (PDD) in Figure 2. This PDD consists of two different, yet connected parts. On the left-hand side, the activities conducted during this research project are modeled. The deliverables as a result of these activities, connected with dashed lines, are modeled on the right-hand side of the diagram. An advantage of PDDs is that the diagrams are relatively clear, compact, and are modeled with a notation that is similar to UML diagrams, and are thus easy to understand (Van de Weerd & Brinkkemper, 2008). This modeling technique is often used when describing methods, an aspect of method engineering (Brinkkemper, 1996). In addition, the PDD is also accompanied with an activity and concept table. Both tables provide short but comprehensive descriptions of the activities and concepts described. Due to their large size, the activity and concept tables can be found in Appendix B and C, respectively. The following subsections will summarize the research steps taken and their resulting deliverables in the same order as they are presented in Figure 2.

### 3.4.1 Preparation

This thesis project started out with an identification of research opportunities within this domain of research. As a consequence, a PROBLEM STATEMENT was written. Thereafter, multiple RESEARCH QUESTIONS were formulated that are based on said PROBLEM STATEMENT. The PROBLEM STATEMENT has been embedded in the Introduction (Section 1) of this thesis.

### 3.4.2 Focused Literature Studies

After the aforementioned preparations for this research were made, focused literature studies were conducted on three different topics, each within their respective domains. This concerned a study of the current STATE OF THE SOFTWARE INDUSTRY LITERATURE in the Netherlands, EVOLUTIONARY ECONOMICS LITERATURE to address and clarify actions undertaken by actors within ecosystems on various levels (micro, meso and macro), and ECONOMIC GEOGRAPHY LITERATURE to clarify and understand manifestations of regional ecosystems (clusters) of actors within regions (again on the different aforementioned scope levels), innovation systems and drivers behind spatial clustering. The resulting written reports were used as input for a THEORETICAL BACKGROUND that presents an overview of findings addressed in existing literature that together constitute the foundation of this research. After the THEORETICAL BACKGROUND was written, the Finnish software industry survey (2012) was analyzed in order to distill a common set of generic survey questions that also apply to Dutch product software companies. The result of this analysis was a PRELIMINARY SOFTWARE INDUSTRY SURVEY, solely containing generic questions about e.g. delivery models, business models, types of products offered, growth expectancies, and so forth. Considering this activity is neither part of the focused literature studies nor the case studies, it is modeled as a stand-alone activity.

### 3.4.3 Case Studies

After the focused literature studies and an analysis of the Finnish software industry survey were conducted, initial preparations for the case studies were made. First, selection criteria were formulated to ensure candidate case study participants are representative for the domestic software industry, yet at the same time being as diverse as possible to enhance reliability and external validity of the outcome of this research. This resulted in a LIST OF CASE STUDY CRITERIA. Hereafter, CASE STUDY CANDIDATES were identified that met the formulated selection criteria. A representative set of CASE STUDY PARTICIPANTS was composed afterwards. Three separate INTERVIEW PROTOCOLS ensuring that all necessary research steps and measures are predefined were then tailored to the CASE STUDY PARTICIPANTS (software companies, cooperative networks and governmental representatives), to ensure a similar approach was taken when conducting each individual case study. It should be noted that all of the aforementioned case study steps were performed according to a tailored case study protocol, of which the LIST OF CASE STUDY CRITERIA and INTERVIEW PROTOCOLS are constituents.

As soon as the INTERVIEW PROTOCOLS were created, was a DOCUMENT STUDY about the CASE STUDY PARTICIPANTS performed to gather additional background information. This led to increased common ground when conducting the interviews. Hereafter, the case studies by means of interviews were conducted, of which INTERVIEW TRANSCRIPTIONS were made. Both the DOCUMENT STUDIES and INTERVIEW TRANSCRIPTIONS were stored in a CASE STUDY DATABASE. The results of the case studies were then interpreted, leading to a CASE STUDY REPORT.

### 3.4.4 Survey

Before the annual Dutch software industry survey could be finalized, a DATA ANALYSIS REPORT was written by combining and analyzing the results of the literature studies and the case studies stored in the CASE STUDY DATABASE. Based on this DATA ANALYSIS REPORT, multiple non-generic SURVEY QUESTIONS were formulated, contrary to the generic survey questions defined in the PRELIMINARY SOFTWARE INDUSTRY SURVEY. These SURVEY QUESTIONS, including the PRELIMINARY SOFTWARE INDUSTRY SURVEY version, resulted in a SOFTWARE INDUSTRY DRAFT SURVEY that was evaluated by multiple academics and experts, and led to an EVALUATION REPORT. The SOFTWARE INDUSTRY DRAFT SURVEY was modified accordingly and resulted in a SOFTWARE INDUSTRY FINAL SURVEY that met all the aforementioned criteria and addressed all issues listed in the EVALUATION REPORT. After the SOFTWARE INDUSTRY FINAL SURVEY was considered final, multiple initiatives such as personalized invitations via email and press coverage were undertaken to promote the survey. The survey participants had a timeframe of approximately two months (including multiple deadline extensions) to fill out the survey. The results of the survey led to the construction of a SURVEY RESULTS DATABASE.

### 3.4.5 Closure

Based on the aforementioned SURVEY RESULTS DATABASE and CASE STUDY DATABASE, concrete RECOMMENDATIONS were formulated after having analyzed the survey results. These RECOMMENDATIONS concerning how the state of business, educational and governmental partnering within regional software ecosystems could be improved were then presented to all stakeholders of this research project by means of an ADVISORY REPORT. Apart from further research steps concerning the thesis itself such as *finalize thesis* or *write papers* that have been omitted in this diagram for the sake of brevity, this ADVISORY REPORT can be considered to be the final deliverable of this research project.

### 3.5 Validity

In order to enhance the validity of this research, *tests* as described by Yin (2003) have been carried out to ensure attention is paid with regard to construct validity, internal validity, external validity, and reliability of the results of the case studies and the survey. In order to enhance construct validity, multiple case studies with different types of sources of evidence were held to allow for *triangulation*. In addition, each interview was summarized by means of short answers to each question based on notes taken. These answers and notes were stored in a case study database to create and maintain a *chain of evidence*. If possible, case study participants were asked to *review the results of the case studies* to verify whether or not the data used is correct. With regard to enhancing internal validity, *explanation-building* was performed that fits the explanatory and explorative nature of the case studies. At first, initial expectations were formulated before the case studies were conducted. After the first case study was conducted, the results of the initial case study were compared with the expected findings. The same has been done for each follow-up case study, taking into account the results of the case studies that took place before them (i.e. *incremental analysis*). As such, the formulated statement based on the gathered data had to be revised multiple times due to newly gathered facts from every additional case study. This process has been repeated multiple times. In order to prevent from drifting away from the original topic of interest due to the great amount of data gathered, *constant references to the original purpose* of the inquiry helped to reduce this problem and to *retain focus* on the subject of study. The case study protocol and related interview protocols helped to marginalize this threat.

To enhance external validity, *multiple case studies* were conducted with the different types of case study participants (cooperative networks, software companies and governmental representatives) as single cases typically offer a poor basis for generalization of results. This is particularly applicable to this research project, since regions are inherently different from each other from both a tangible (administrative organization, regional size, differing specializations) as well as an intangible (social capital and institutions) perspective. Since the type of generalization we strived for is of an analytical nature, we aimed to *replicate the findings* found in initial case studies by means of multiple additional case studies. Finally, in order to enhance reliability of the results, a *case study protocol* was created based on guidelines provided by Brereton et al. (2008), which was then reviewed by multiple academics and experts and eventually subjected to a *checklist* as provided by Runeson and Höst

(2009). In addition, a *case study database* was also developed in which documentation of the results of the case studies were stored, as well as other relevant files such as recordings and transcriptions.

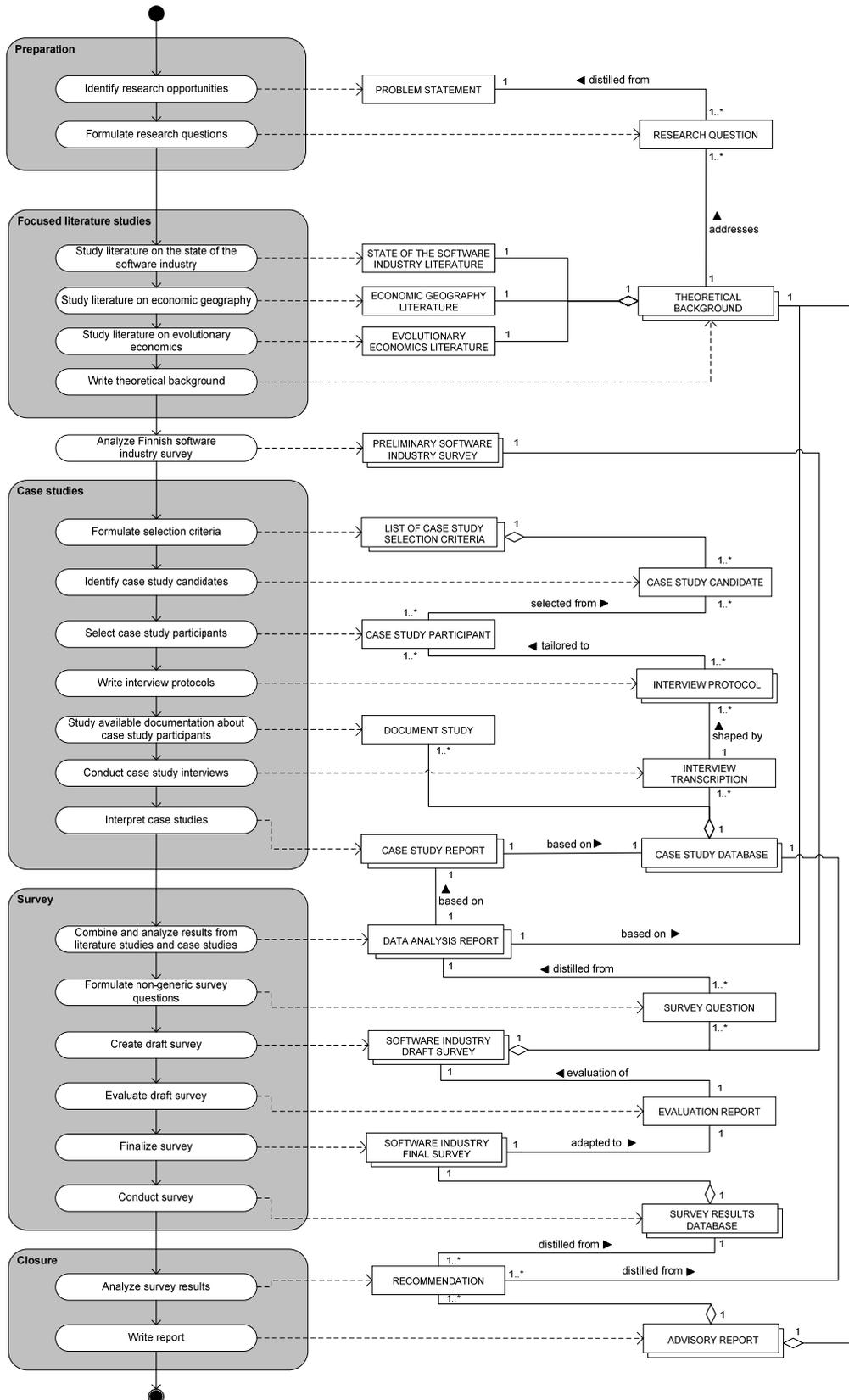


Figure 3: Process-deliverable diagram showing the research steps taken and their resulting deliverables

## 4 Theoretical Background

Central to this research project was to study how business, educational and governmental partnering within regional software ecosystems can be improved. Before conducting empirical research, constructing a survey, and analyzing the resulting data accordingly upon which concrete recommendations were given, it was considered pivotal to understand and gain insight in the key elements that were subjects of study. We will therefore first discuss what the concept of a regional software ecosystem is by providing definitions for key elements, what scope we utilized when studying regional ecosystems, and what causes ecosystems in specific areas to form. Second, we will elaborate upon why regional ecosystems are prone to self-reinforcing effects or lock-ins, by making use of a systems of innovation perspective. The latter perspective will also be subject of discussion, as it allowed to gain insight in how regional ecosystems are structured and composed, what mechanisms trigger interaction among participants inside an ecosystem, and how this interaction takes place. Due to the evolutionary basis of the innovation systems perspective, a short analysis will be provided on the applicability of evolutionary economic concepts in the software industry that has hitherto not been introduced in scientific literature. Finally, we discuss how business, educational and governmental partnering within regional ecosystems in general can be improved based on scientific literature, and what methods of analysis were at our disposal to do so.

### 4.1 Regional Ecosystems

More than ever before are firms nowadays able to acquire capital, goods, services, information and technology anywhere from around the world (e.g. (Best, 1990; Gibbons et al., 1994; Maskell, Eskelinen, Hannibalsson, Malmberg, & Vatne, 1998)). Next to this ease of acquisition, modern technology also enables organizations to get within reach of e.g. larger customer bases and global partners. For instance, it is no longer a necessity to be physically located near other markets in order to either serve them or to attain goods or services (Porter, 2000). As a consequence, one could argue that the influence of geographical proximity between firms in our modern day competitive world has become less relevant, or even nullified. The latter, however, is far from reality. In fact, the most innovative and successful organizations producing related goods or services are often spatially concentrated in specific areas such as IT firms in Silicon Valley, international financial services in New York and London, and fashion shoe companies in northern Italy (Porter, 1998; Richardson, 1995).

#### 4.1.1 Key Definitions

The main factor contributing to the formation, sustainment and reinforcement of spatial concentrations of economic actors producing related goods or services within regions, is the establishment of relationships among these actors. Relationships are primarily established in the search for mutual benefits such as the exchange of knowledge and a focus on innovation (Best, 1990; Rutten, 2003), regardless of whether these relationships are contractually defined or informal (Van Angeren et al., 2013). A great number of benefits of relationship establishment among firms have already been identified and thoroughly described in scientific literature. In the product software

industry, for instance, frequent intentions of relationships initiated among actors are product, time-to-market and process cost benefits (Ulaga & Eggert, 2005), exploring new opportunities and penetrating new markets (Popp, 2011), and facilitating international growth (Coviello & Munro, 1997). Although the geographical locations of actors among which relationships are established may vary greatly, the specific interest and focus of this research lies on relationships established between actors located in within regional ecosystems.

In general, regional ecosystems are described as concentrations of firms producing related goods or services. The term region, however, is difficult to define since regions do not always have fixed boundaries. Rutten and Boekema (2007) argue that *“In the regional economic literature such sub national regions may be as small as city regions or as big as about half a country, such as the Randstad region in the western part of the Netherlands. Economic, social, and cultural characteristics may help define the size of a region in regional economic analysis.”* In our case, we analyze regions in the same manner, considering there exists no such thing as boundaries of a regional software ecosystem. In addition, as noted before, the focus of this research lies on product software. When speaking of the latter, we utilize the definition of Xu and Brinkkemper (2007) who define product software as *“a packaged configuration of software components or a software-based service, with auxiliary materials, which is released for and traded in a specific market.”* With regard to the term ecosystem when speaking of regional software ecosystems, we refer to the work of Jansen, Finkelstein, and Brinkkemper (2009) who define a software ecosystem as *“a set of actors functioning as a unit and interacting with a shared market for software and services, together with the relationships among them. These relationships are frequently underpinned by a common technological platform or market and operate through the exchange of information, resources and artifacts.”* Our research utilizes the foregoing definitions, although strong emphasis is put on the regional dimension when studying software ecosystems.

#### **4.1.2 Relationship Establishment and Clustering**

One of the most prominent triggers for firms to establish relationships with other firms producing related goods or services in their regional ecosystem, is to exchange knowledge. This is not odd, considering organizations regard knowledge as a strategic resource fueling their innovative performance, in turn aiding them to achieve and sustain competitive advantages (Argote & Ingram, 2000; Grant, 1991; Zack, 1999). An important characteristic of knowledge is that its externalities (i.e. spillovers) are often geographically bounded, implying that the greater the distance between firms, the lesser the intensity of the externalities and the more difficult it becomes to transfer knowledge between firms (Boschma, 2005). In addition, research also shows that spatial proximity between actors in a network reduces coordination costs, while simultaneously increasing flexibility (Best, 1990; Rutten, 2003). Although this may seem particularly prevalent for tacit knowledge that is difficult to transfer to other actors and requires an absorptive capacity (i.e. complementary knowledge base) (Howells, 1996; Morgan, 2004; Nonaka, 1994; Rutten, 2003), this may even apply to the exchange of codified knowledge as, according to Boschma (2005), its interpretation and utilization still demand tacit knowledge and thus spatial closeness. Taking this geographical dimension of knowledge externalities into account, it is thus not surprising that firms producing

related goods or services are often concentrated in regional ecosystems to mutually prosper from such knowledge externalities.

Based on statistical data concerning the Dutch software industry, Te Velde et al. (2010) found that large concentrations of software companies producing related software can also be found in the Netherlands. These concentrations are located primarily near universities, large influential software companies, and at the borderline between the provinces of Utrecht and Gelderland. Educational organizations such as universities for instance create new knowledge that is often complementary to the goods and services offered by firms located inside the same regional ecosystem. In addition, universities also provide inputs for industrial innovation processes by means of human capital, being either the education of graduate students becoming industry researchers, or through personnel mobility flowing from universities to nearby firms (Schartinger, Rammer, Fischer, & Fröhlich, 2002). The presence of smaller software firms around large influential software companies can be largely explained as either a manifestation of spin-offs where often former employees of large firms begin their own firm within close proximity to the firm from whence the employee(s) came, or small software firms serving a niche based on the technology or platform provided by a larger company within close proximity of which SAP's Partner-Port in Walldorf, Germany is an example. The concentration of software companies on the borderline between the provinces of Utrecht and Gelderland largely consist of numerous spin-offs, of which most are based on the business scene of the former Baan-imperium. The clustering of firms near universities and large firms are prime examples that localized knowledge spillovers often lead to the birth of startups, new ventures and spin-offs, and offer both tangible advantages (e.g. job creation, investment, tax income) and intangible advantages (e.g. economic renewal and entrepreneurial dynamism) (Ndonzuau, Pirnay, & Surlemont, 2002).

Empirical research in other countries has presented similar conclusions with regard to regional clustering of organizations producing related goods or services to more effectively compete on the global market (Cooke, 2002; Porter, 1998). Jaffe, Trajtenberg, and Henderson (1993) found that knowledge spillovers are geographically localized by means of comparing the geographic locations of patent citations with that of cited patents. The authors found that citations are more likely to come from areas where the cited patents originated from, reflecting a pre-existing concentration of related research activity that was found to be particularly significant at the local level. Audretsch and Feldman (1996) found similar results, being that industries that were more knowledge-intensive than others were spatially concentrated (e.g. due to complementary knowledge exchange benefits). Asheim and Gertler (2005) affirm these results, and also found that the more knowledge-intensive an economic activity is, the more geographically concentrated it tends to be. Finally, Adams and Jaffe (1996) also found that in most cases geographical distance between firms producing related goods or services affected the productivity of research and development conducted by firms, with firms being spatially close showing better results than counterparts located at greater distances from each other.

#### **4.1.3 Cooperative Networks**

A frequent observation when studying firms establishing relationships with other actors in regional ecosystems, is that these actors organize themselves in dedicated cooperative networks. Such

networks represent the interests of their members by an array of means, such as facilitating networking events, providing practical advice, and connecting members to create joint venture opportunities. Gnyawali and Madhavan (2001) mention four main reasons why networks in general allow firms to benefit from resources present inside networks. First, cooperative relationships can serve as access routes to internal resources held by connected actors (Nohria, 1992), of which knowledge or investment capital are examples. Second, capabilities possessed by other firms within a network often complement the internal resources of a firm due to the related nature of the goods and services produced (Langlois, 1992; McEvily & Zaheer, 1999). An example of such a capability is relevant specialized knowledge possessed by a well-educated labor force present within connected firms. Having access to complementary specialized knowledge can be a major benefit to firms, as Reich (1991) and Florida (2002) argue that such knowledge is one of the main production factors in a knowledge-based economy. Third and closely related to the second reason mentioned, new capabilities in turn allow a firm to attract other firms, reinforcing the networks of members of cooperative members (Powell, Koput, & Smith-Doerr, 1996). Fourth and finally, according to Burt (1992), the 'rate of return' on internal resources of a firm is determined by how well structured the network of the firm is. By being part of a cooperative network, the network of a firm is more accessible due to a shared affiliation and sense of trust (Klein Woolthuis, Hillebrand, & Nooteboom, 2005), in turn making the network easier to manage. Although firms may thus benefit from participating in cooperative networks with rivaling firms, competition among them often remains fierce (Bengtsson & Kock, 2000). To describe this delicate balance between cooperation and competition between firms, Brandenburger and Nalebuff (1996) introduced the portmanteau term 'coopetition'. Establishing or intensifying relationships with other actors within the region should therefore not be seen as a general means to achieve success.

Numerous dedicated cooperative networks with a focus on product software companies can be found throughout the Netherlands. Different terms are used by the cooperative networks by which they market themselves, such as "*program office*", "*foundation*", or "*platform*". Although these terms differ, activities organized by cooperative networks and their objectives are largely identical. Differences do exist with regard to the size (amount of members), scope and financing of cooperative networks. For instance, some organizations may erect and sponsor a cooperative network themselves in the search for mutual benefits with potential partners. In such cases, these organizations are also responsible for orchestrating their networks and as such function as a gatekeeper, possibly leading to the exclusion of competitors. In the contrary, cooperative networks may also stem from governmental initiative, to stimulate innovation by promoting knowledge exchange between firms that are supported to become a member of a cooperative network. Such kind of cooperative networks then function as independent entities responsible for the orchestration of the network, but welcome anyone able to contribute or benefit from network membership. For the sake of clarity and considering a definition of a cooperative network is non-existent in scientific literature, we define a cooperative network as "*An organization that aims to bring firms with an interest in software products or services together, promoting the exchange of knowledge between these firms and engagement in the search for mutual benefits.*"

Worth mentioning is that it is common for cooperative networks to have a number of 'participants', of which financial organizations, insurers, law firms, consultants, and employment agencies

(recruiters) are typical examples. Although such firms do not produce goods or services directly related to software, they often benefit from close ties with software firms to e.g. be kept up to date concerning IT developments giving them a competitive edge, to scout for investment opportunities, or to offer their services by getting within reach of a larger customer base.

## **4.2 Regional Development and Innovation**

It is widely acknowledged that knowledge, learning capabilities of organizations and innovation are main drivers for economic development and competitiveness of organizations, regions and nations (Bottazzi & Peri, 2003; Cooke, 2002; Porter, 1990; Teece, 2000; Tödting & Trippel, 2005). Knowledge and learning spark innovation, innovative companies have competitive advantages, and in turn create more jobs, pay higher wages to their employees, and pay higher taxes. With regional networks consisting of a wide array of stakeholders facilitating the aforementioned exchange of knowledge and stimulating innovation, the question remains how truly effective regional networks turn out to be when it comes to turning tangible assets into economic development. Rutten and Boekema (2007) state that the success of this transformation depends on the intangible assets present within regions, such as a shared culture, trust, and social capital. Since innovation as aforementioned is a process of collaboration between actors in the search for mutual benefits (Best, 1990; Rutten, 2003), the eventual outcome of this process will depend on how smoothly organizations in a regional network cooperate, for which regional intangible assets (i.e. social capital) are of vital importance (Lorenzen, 2007; Rutten & Boekema, 2007).

### **4.2.1 Importance of the Regional Dimension**

The importance of regions and their intangible assets has long not been recognized by industrial policymakers. According to Tödting and Trippel (2005), the linear model of innovation policy was dominating until the 1990s. This linear model of innovation postulates that innovation commences with basic research, is then followed by applied research and development and eventually ends with production and diffusion (Godin, 2006). Tödting and Trippel (2005) argue that this model led to a strong emphasis on providing a research and development infrastructure, financial innovation support for organizations and the transfer of technology. As such, the focus of these policies was to supply the required input for innovation to take place and necessary instruments, without taking into consideration the absorptive capacity of organizations that is quintessential to effectively use the supplied inputs and instruments (Boschma, 2005). In addition, Tödting and Trippel (2005) also mention that behavioral characteristics, the management and organizational deficits were not adequately taken into account of which Lagendijk (2000) stresses their importance. As a consequence of the foregoing, instruments supplied were addressed to companies on an individual basis and applied in an uncoordinated manner resulting in ineffective innovation stimuli (Asheim, Isaksen, Nauwelaers, & Tödting, 2003).

The focus on the aforementioned linear innovation model that dominated policymaking until the 1990s, has recently shifted to more attention for local clustering of highly innovative producers of high technology goods and services as described by Camagni (1991) and Ratti, Bramanti, and Gordon

(1997), high-tech regions as described by Keeble and Wilkinson (1999, 2000), clusters of industries heavily reliant on knowledge (Cooke, 2002) and the importance of knowledge spillovers (Audretsch & Feldman, 1996; Bottazzi & Peri, 2003; Krugman, 1991). The problem with the results of the aforementioned studies, however, is that they are based on analyzing successful and well-performing regions such as Silicon Valley in the United States, or the High Tech Campus Eindhoven in the Netherlands. Tödtling and Trippl (2005) point out that this approach is often used in an undifferentiated manner, even though regions may differ from each other in many respects primarily due to differences in intangible assets that are of vital importance to turn tangible assets into economic development (Lorenzen, 2007; Rutten & Boekema, 2007). Examples of such differences in intangible assets are social capital (Field, 2003; Iyer, Kitson, & Toh, 2005), and institutions such as a culture of shared trust and practices (Klein Woolthuis et al., 2005; Nelson & Winter, 1982) that, like knowledge, contain a certain degree of 'tacitness' and are difficult if not impossible to mimic by other regions (Gertler, 2003).

#### 4.2.2 Innovation System Approach

A popular concept to measure the effectiveness of e.g. nations, regions and sectors transforming tangible assets into economic development facilitated by the aforementioned intangible assets, is to pay attention to the systematic character of innovation processes. Emphasizing the systematic character of innovation processes began with a novel approach to understanding the nature of innovation processes, that emerged and firmly established itself in both the academic world and in practice in the early 1990s (Edquist, 2004). Pioneered by Lundvall (1992) and Nelson (1993), this theoretical school is called the innovation system approach and initially had its focus on a national level, hence they are often termed national innovation systems (NIS). Edquist (1997) described the emergence of the systems of innovation approach, which Tödtling and Trippl (2005) concisely summarize by stating that an innovation, according to the system of innovation approach, should be studied as *"an evolutionary, non-linear and interactive process, requiring intensive communication and collaboration between different actors, both within companies as well as between firms and other organizations such as universities, innovation centers, educational institutions, financing institutions, standard setting bodies, industry associations and government agencies"*. As such, the systems of innovation approach has its focus on the determinants of innovation, rather than their consequences such as economic growth and job creation (Edquist, 2001).

Based on the initially intended purpose of innovation systems, other variants emerged (Edquist, 2001). Examples of such variants are technological innovation systems (Carlsson & Stankiewicz, 1991; Hekkert et al., 2007), sectoral innovation systems (Breschi & Malerba, 1997) and regional innovation systems (Braczyk, Cooke, & Heidenreich, 1998). A technological innovation system takes, as the name implies, a systems view of technological change. According to this view, neither firms nor innovations, when regarded as individual entities, can explain economic change. Instead, Carlsson and Stankiewicz (1991) argue that firms and innovations must be regarded as parts of a larger system, where different types of agents (i.e. adopters and regulators) interact with each other in a context shaped by both formal institutions (i.e. laws) and informal institutions (i.e. values, norms, practices). Due to an emphasis on interaction between actors in a broad context shaped by

institutions, the technical innovation system approach is useful to explain the emergence of new kinds of technologies (e.g. sustainable energy technologies (Hekkert et al., 2007)) in terms of how and why it was developed, and how it eventually either diffused into a society or has not succeeded in doing so. The sectoral innovation system approach, in turn has its focus on technology fields or product areas in which firms generate and utilize technologies present in this sector. Firms in a sectoral system are thus related through processes of cooperation among firms to develop technologies and artifacts, as well as competition by means of selection effects while performing innovative and market activities (Breschi & Malerba, 1997; Malerba, 2002). The regional innovation system variant will be discussed in the following subsection.

### 4.2.3 Regional Innovation Systems

Another major variant of the innovation system approach emerged primarily during the previous decade, being regional innovation systems (RIS) approach. Although national, technological and sectoral factors are undeniably essential to study innovation processes from different complementary perspectives, more and more scholars argue that the regional dimension – when studying innovations – is crucial due to the aforementioned intangible assets present within regions that greatly determine whether tangible assets are effectively turned into economic development (Tödtling & Trippl, 2005). Asheim and Isaksen (1997) and Metcalfe (1995) make similar remarks, arguing that the national scope level may be too broad to get an understanding of the complete dynamics at work of technological accumulation and to understand the importance of regional and specific resources stimulating innovation capabilities and competitiveness of firms and regions. Numerous studies such as the work of Beugelsdijk and Van Schaik (2005) confirm that regions may significantly differ from each other, making regions rather than nations a more appropriate geographical level of study. To address the importance of regional dimensions, a RIS has its focus on the firms, clusters and institutions present within an innovation system, including interdependencies between actors within regions and to higher scope levels. Tödtling and Trippl (2005) present a concise summary of four reasons why the regional dimension that is central to this type perspective of innovation system, is of vital importance concerning policymaking.

First, Tödtling and Trippl (2005) argue that not all regions possess the same industrial specialization pattern and innovative performance. As a consequence, the authors postulate that no ‘best practices’ exist with regard to innovation policies that could be applied to any type of region in an undifferentiated manner. Breschi (2000) argues that although innovative activities performed by actors generally tend to concentrate within specific locations, the intensity of this geographical concentration of actors and the spatial organization of the innovative processes may differ significantly across sectors. The author provides the example that whereas in some industries a little number of large firms compete at the global level and are responsible for generating the greatest share of innovations, this may be the total opposite for other industries depending on the nature of the technology itself. Howells (1999) presents similar claims, namely that regions display distinctive systems when compared to each other that not solely concerns the nature of the institutional context, industrial and technological specialization, but also in the overall level of innovative performance and distinctiveness of the spatial organization of firms within regions.

Second, Tödting and Trippl (2005) mention that knowledge spillovers that play a quintessential role in innovation processes are often geographically bounded. Jaffe et al. (1993) found that innovators generally cite patents from companies within close proximity more frequently, indicating knowledge flows related to innovation (by means of analyzing patent citations) tend to cluster. Audretsch and Feldman (1996) found evidence that industries in which R&D, university research and skilled labor play pivotal roles for innovation, tend to cluster together compared to industries that are less reliant on knowledge externalities. Anselin, Varga, and Acs (1997) present similar results and found evidence of local spatial externalities between research conducted by universities and complementary high technology activities performed by neighboring firms. Finally, Bottazzi and Peri (2003) found that the effects of R&D are significantly localized. According to the authors, a doubling of R&D spending in a region would increase its output of new innovative ideas by 80-90%, whereas other regions located within a proximity of 300 kilometers benefit only a 2-3% increase in output.

The third reason Tödting and Trippl (2005) provide as to why the regional dimension is of crucial importance concerning policymaking, is tacit knowledge that is essential to the success of innovations, is found to demand geographical proximity between actors in order to be effectively transferred. Howells (2002) argues that tacit knowledge cannot be communicated to other actors in any direct or codified way, as it concerns direct experience that cannot be transferred in a codified way by means of artifacts. Gertler (2003), in turn, argues that tacit knowledge is the most important foundation for innovation-based value creation, as modern day success of firms depends on the ability to produce new or improved products and processes for which tacit knowledge is essential. In summary, tacit knowledge that is difficult to transfer through regions and that is crucial for successful innovation output, demands geographical proximity between actors in order to facilitate this exchange. An example of a means by which this exchange can be facilitated are demonstrations during routine personal contact occasions that are built upon a relationship of trust (Maskell & Malmberg, 1999; Morgan, 2004).

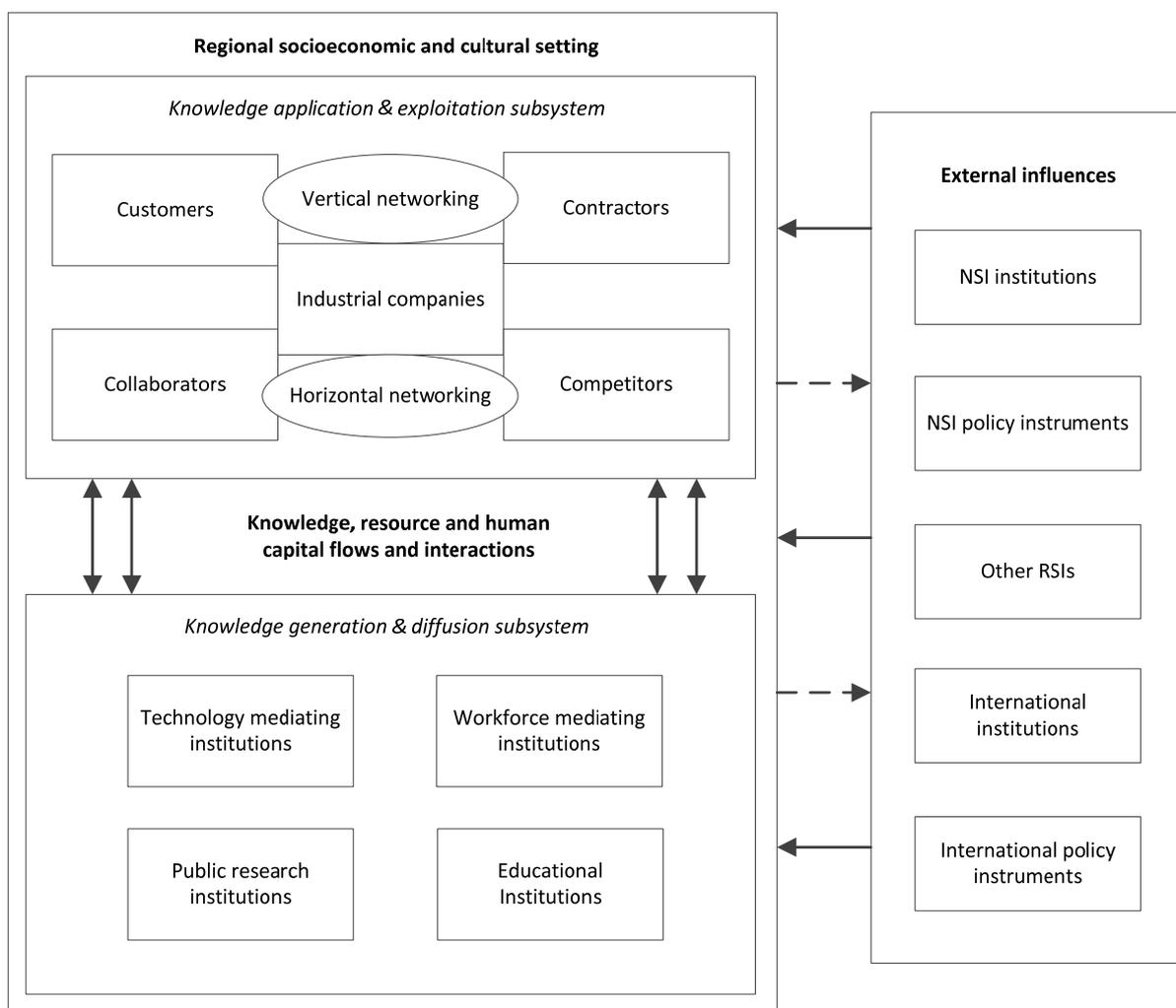
Fourth and finally, based on the book of Cooke, Boekholt, and Tödting (2000) in multiple chapters are devoted to how innovation is governed in Europe, Tödting and Trippl (2005) mention that competences of policies and both formal institutions (i.e. laws and governing organizations) and informal institutions (i.e. social capital, practices and values) are partly bound to regional territories. Actions of governing organizations and laws evidently have limited political power bound to demarcated areas, hence their influence is limited from a geographical perspective. The same holds for informal institutions such as the practices, values and trust that shape the informal environment of a region that are built up over longer periods of time (Klein Woolthuis et al., 2005).

#### **4.2.4 Structure of a Regional Innovation System**

Now that we have discussed why the regional dimension is of key importance concerning policymaking, we turn ourselves to the components that together constitute a RIS. A multitude of studies have addressed the structure and forms of RISs such as Autio (1998) providing a framework addressing the aforementioned structure, concepts and characteristics of RISs; Doloreux (2002)

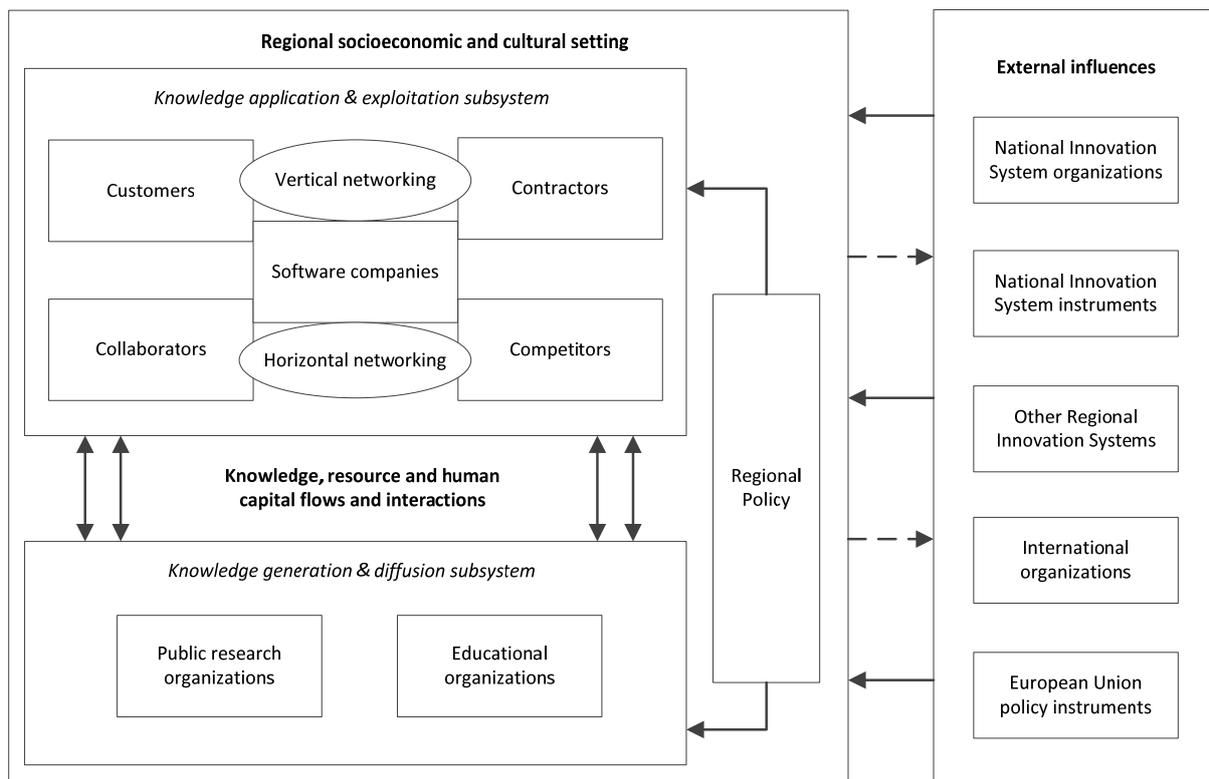
addressing the origin and variety of forms of RISs including a critical review on what concepts it does and does not address; Howells (1999) arguing why a national scope level of analysis is too broad to get an in-depth understanding of the complete dynamics behind an innovation system and why a regional scope level contrary to a national scope level is more appropriate; and Mytelka (2000) presenting a conceptual framework situating national and local innovation systems within a global context, including examples to illustrate the utility of this framework.

The work of Autio (1998) on the structure of regional innovation systems (as shown in **Figure 4**) provided a starting point to analyze regional software ecosystems central to this research project. The author elaborates upon all regional and external stakeholders involved and their linkages. Based on a plethora of studies and progressive insight, however, Tödtling and Trippel (2005) argue that the regional policy dimension had to be added to the model that was lacking in the initial model of Autio (1998). The motivation Tödtling and Trippel (2005) provide for this inclusion, is that policy actors at a regional level can play effective roles in shaping regional innovation processes, as long as there is a sufficient extent of regional autonomy from both a legal and financial perspective to formulate and implement innovation policies (Cooke et al., 2000; Cooke & Memedovic, 2003).



**Figure 4: Schematic illustration of the structure of a Regional Innovation System (redrawn from Autio (1998)).**

Since this research project has an exclusive focus on regional software industries, minor adaptations to the regional innovation system model of Autio (1998) had to be made to tailor the model to our research context. Alterations that have been made include renaming ‘industrial actors’ to ‘software companies’ to emphasize the focus on regional software industries; the removal of technology mediating institutions and workforce mediating institutions from the knowledge generation and diffusion subsystem due to being considered out of scope for this research project; the inclusion of the ‘regional policy’ dimension of which the importance is stressed by Tödtling and Trippl (2005); and renaming the ‘international policy instruments’ to ‘European Union policy instruments’. Our own modification of the model provided by Autio (1998) is depicted in Figure 5.



**Figure 5: Composition of a regional innovation system scoped towards regional software industries (own modification of Autio (1998)).**

As shown in Figure 5, a clear distinction is made between the two main building blocks of regional innovation systems (RISs), also called sub-systems, being *knowledge application and exploitation entities* on the one hand, and *knowledge generation and diffusion entities* on the other hand. The former subsystem consists primarily of industrial firms, whereas the latter subsystem comprises primarily public sector institutions that have an active role in creating and diffusing knowledge. This distinction, however, is a rough simplification as industrial firms often also carry out knowledge generation and diffusion activities and vice versa for public sector institutions applying and exploiting knowledge (Autio, 1998). The main purpose of this distinction is to divide the stakeholders between public and private sector organizations, and between commercial and non-commercial activities for the sake of clarity.

The *knowledge application and exploitation subsystem* is responsible for the commercial activities carried out in a RIS. Every industrial company (in our case a software firm) in an economic system competes to secure a strong market position and to gain access to complementary assets to achieve and sustain a competitive market position (Autio, 1998). These complementary assets can be accessed by means of establishing relationships with other software firms as already elaborated upon in Section 4.1. The main groups of interest with which relationships are established comprise Customers and Collaborators from a horizontal networking perspective, and Contractors and Competitors from a vertical networking perspective. For instance, maintaining relationships with customers by involving them during requirements management can provide valuable feedback to aid software companies with selecting the right requirements from an enormous number of candidate requirements (Kabbedijk, Brinkkemper, & Van der Veldt, 2009). Collaborative (or inter-organizational) relationships are key to improving the capability of firms to let interactive learning take place, which is important as knowledge and resources are distributed over a wide variety of organizations within a region (Hendry & Brown, 2005; Howells, 1999). Maintaining relationships with contractors (suppliers) in the product software industry is essential since many software vendors deliver software products to end-customers that contain commercially-of-the-shelf (COTS) components (Jansen, Brinkkemper, & Helms, 2008). These COTS components are acquired from suppliers, thus causing a supplier-dependence based on the perceived importance of a component for the total product (Van Angeren, Blijleven, & Jansen, 2011). Two other prominent examples of relationships established with contractors, are outsourcing for example the development phase of software product development, or to acquire services to for instance perform the requirements analysis phase (Van Angeren et al., 2013). Finally, relationships with competitors are established because of a congruence of interests, for instance to mutually benefit from cost-effectiveness and stronger bargaining positions when performing collective purchases to e.g. acquire software licenses.

The *knowledge generation and diffusion subsystem* comprises two types of institutions that serve and operate primarily in the public domain, contrary to entities in the knowledge application and exploitation subsystem. These institutions produce and disseminate both tacit and codified knowledge, technical skills and competences (Autio, 1998). The public research institutions comprise entities that produce and disseminate technological knowledge that is generally publically available. This knowledge is disseminated to the public by means of e.g. journals and seminars. An example of a public research institution in the Netherlands is TNO. This publicly available knowledge can be disseminated to the public by either public research institutions themselves, or disseminated through e.g. technology mediating institutions. The latter type of institution comprises entities that are concerned with disseminating publicly available technologies often in a highly codified form with high commercial maturity, contrary to outputs from public research institutions (Autio, 1998). The other type of institution, educational organizations, contribute to the regional skill base (e.g. employees and complementary knowledge) which the knowledge application and exploitation subsystem can make use of. Typical educational institutions are universities, vocational schools, or training institutions.

The framework also includes influences from five types of *external forces* (Autio, 1998). First, a RIS can be subjected to influences from other RISs, whether within close proximity or on a global scale.

For instance, Best (1990) and Cooke (2002) argue that linking regional networks to global partners can give regional networks access to valuable external resources such as knowledge, financial capital and market opportunities, in turn reinforcing the strength of regional networks. The same holds for linking regional networks to other regional networks, whether or not located within the same country. In addition, the overarching NIS may also exert influence over RISs, primarily by means of policy interventions, funding and subsidies for innovation. The same holds for influences from policy instruments belonging to the European Union, or even international organizations (Autio, 1998). Influences from international organizations and in particular the European Union have augmented over the past few years. One example of a European policy initiative is the recent establishment of the European Service Innovation Centre (ESIC) that aims to *“help regions harness service innovation for structural change”* by means of *“support[ing] regions in the design of better policies to transform existing, and boost emerging industries by unlocking the transformative power of service innovation”* (European Commission, 2012).

Finally, Autio (1998) argues that RISs are essentially viewed as social systems that are composed of sub-systems interacting with each other. The interactions that take place between different types of actors of the sub-systems drive the evolution of RISs. The author also argues that the most prevalent interactions driving this evolution comes from the knowledge application and exploitation subsystem, as the author argues that innovation is largely about commercialization.

### **4.3 Evolutionary Economics and Dynamics**

Many economic-geographical models and theories are based on evolutionary-economic principles. Several of such models have already been discussed in Section 4.2, of which national innovation systems (Lundvall, 1992; Nelson, 1993), regional innovation systems (Autio, 1998; Tödting & Trippel, 2005) and technological innovation systems (Carlsson & Stankiewicz, 1991; Hekkert et al., 2007) are the most prominent examples. As aforementioned, the theory of innovation systems aims to understand and clarify how organizations and institutions within a system (e.g. national, regional, technological) use resources and existing knowledge, to produce new knowledge that creates new economic value (Kastelle, Potts, & Dodgson, 2009). Key to such analyses is to discover what mechanisms drive this economic growth and change.

When studying and analyzing such mechanisms driving economic growth and change, parallels can be seen with evolutionary economics. Although the latter perspective developed in earnest since the 1980s, widespread interest for this perspective began to emerge just recently (Boschma & Martin, 2010). Despite this surging interest, few applications of evolutionary economic theories have been made to study how the software business changes (evolves) over time, regardless of the scale at which it is analyzed. Applying evolutionary economic theories without thought to analyze and describe (regional) software industries would lead to misinterpretations, misunderstanding and misguidance. As such, this section provides an introduction on evolutionary economics concerning its origin and history, its applicability when used to analyze how (regional) software industries change over time, and definitions for the main terminology that are the foundation of evolutionary economics. Since evolutionary economics has never been directly applied before to study (regional)

software ecosystems, we will refrain from scoping down toward a regional level but instead focus on the industry as a whole. Practitioners and researchers can draw insights into the principles of evolutionary economics presented including their connection with the software industry, and apply this knowledge at their own disposal. The majority of the content presented in this subsection is also part of a scientific publication that was accepted and presented at the Seventh International Conference on Digital EcoSystems and Technologies that took place in Menlo Park, California.

#### **4.3.1 Biological Ecosystems and Business Ecosystems**

Business ecosystems have gained interest from researchers and practitioners since their introduction by Moore (1993). Inspired by biology, the concept of business ecosystems provides a metaphor to comprehend the intertwined nature of industries. In the software industry, for example, software producing organizations depend on platforms, libraries and delivery channels provided by third parties to thrive. In later work, Moore defined a business ecosystem as *“an economic community supported by a foundation of interacting organizations and individuals”* (Moore, 1996). To make business ecosystems more applicable to high-technology industries, software ecosystems focus on studying intertwined software companies (Jansen, Brinkkemper, & Finkelstein, 2009), while digital ecosystems put interacting services that facilitate collaboration among entities central in their approach (Briscoe, Sadedin, & Paperin, 2007).

Similar to their biological counterparts, do business ecosystems evolve over time under pressure of competition and innovation (Moore, 1993). A prime example is the software industry, that is often regarded as the epitome of high-technology industries and can be characterized as 'hyper competitive' (Lee, Venkatraman, Tanriverdi, & Iyer, 2010). Other characteristics that shape the software industry are persistent innovation occurring in a rapid manner (Nambisan, 2002) and fast-paced technological change (Grimaldi & Torrisi, 2001; Hagel, Brown, & Davison, 2008). These characteristics contribute to the complexity of reasoning about and understanding the dynamics of the software industry. An ecosystem approach then functions as a framework to see the interconnected and multi-granular reality of a set of entities, to order and comprehend their complexity.

While evolution and the analogy with evolutionary biology is acknowledged within the research domain of digital ecosystems, several key definitions such as inheritance, natural selection and mutation have not been fully explored (Briscoe et al., 2007). Nor have their translated counterparts in evolutionary economics, respectively being routines, competition and innovation, been directly applied to analyze digital ecosystems. The introduction of evolutionary economics based on insights from biology (Dopfer, 2001; Dosi & Nelson, 1994; Hodgson, 1997; Nelson & Winter, 1982) to the domain of ecosystem literature, will provide researchers and practitioners insights in how to apply an economics perspective to study the self-organizing properties of ecosystems. We will therefore introduce and assess the applicability of core evolutionary economics concepts such as bounded rationality, irreversibility, lock-ins, unpredictability and sub-optimal outcomes.

Based on the evolutionary economics concepts introduced, we also present an exemplary diffusion process including illustrative examples for the introduction, expansion and maturity phase of a new product, technology or service that alters the structure of an ecosystem. By means of the illustrative diffusion process provided, actors in an ecosystem can recognize how their ecosystem develops over time and how technological choices and chance events shape the future structure of an ecosystem. Trade-offs can then be considered and balanced to positively impact firm performance as well as the ecosystem(s) in which firms operate.

The remainder of this paper continues with a theoretical background in Section II. The theoretical background contains a brief history and overview of evolutionary biology and evolutionary economics, and discusses their applicability when studying ecosystems. In Section III, we elaborate upon how innovation occurs within a digital ecosystem and provide definitions for the main terminology utilized. A first step towards describing a radical innovation diffusion process from an evolutionary economics perspective including illustrative examples is presented in Section IV. A discussion of the validity and limitations of this research including a summary of the content in this paper is addressed in Section V.

### 4.3.2 Core Definitions and Concepts

Biology and evolution lie at the heart of the ecosystem metaphor that is recurrently applied in the digital era (Briscoe et al., 2007; Moore, 1993). Since we draw upon this analogy from an economics perspective in this thesis, the remainder of this section elaborates upon core concepts in evolutionary biology, their analogy to evolutionary economics and their applicability to ecosystems.

#### 4.3.2.1 Core Definitions in Evolutionary Biology

The basic principle of evolutionary theory is that individuals belonging to a specific species *vary* from their peers, and that these differences are *inherited* (Darwin, 2001). This variation in a population is inextricably linked with natural *selection*, making the chance to survive different for every individual in a given population. Individuals born with physical traits that give them even a slight advantage in their struggle for food, space and security, have a greater chance to survive (selection) and reproduce compared to their less favored peers. Central to evolutionary biology and evolutionary theory are therefore the concepts of **variation**, **selection** and **inheritance** (Darwin, 2001; Dosi & Nelson, 1994; Potts, 2001), which are defined as follows:

- **Variation:** diversity among a species as a result of genetic mutations.
- **Selection:** survival or death of individuals based on superior or inferior physical traits.
- **Inheritance:** genetic material passed on to offspring from parents by means of reproduction.

In evolutionary theory, inheritance of successful traits is pivotal to the survival rate of species. If successful traits would not be inherited by offspring, traits that went through the natural selection process without hindrance would be lost at the death of the individual, and as such not be passed on

to new generations (Darwin, 2001; Nelson & Winter, 1982). In biology, inheritance is ensured by passing on genes from parents to their offspring. The combination of inheritance and selection implies that carriers of traits that augment the chance of reproduction get more offspring that possess the same traits. The share of the population possessing those traits will therefore increase, whereas the share of less favored peers will decrease. This way, change can occur on even the highest level of a population.

Another important part of evolutionary theory, is *mutation* (Darwin, 2001). In case the natural selection process would go its own way without a mechanism that constantly adds new variation to a population, the selection process would be finite and little or no variation would remain (Dosi & Nelson, 1994; Potts, 2001). Even minor genetic disadvantages would eventually lead to extinction, and as a result only one perfect species would remain.

#### 4.3.2.2 Core Definitions in Evolutionary Economics

The rise of evolutionary economics in the late 1970s came as a reaction to systematic criticism on neoclassical economics (Nelson & Winter, 1982). Opponents of the neoclassical approach argued that its equilibrium models with assumptions of among others perfect competition, perfect rationality and a-historicity were a mere caricature of the real world. Contrary to viewing an economic system as a static and predictable environment, evolutionary economics does the opposite (Nelson & Winter, 1982). It regards an economic system as a self-organizing, complex heterogeneous ecosystem with a focus on change. Accordingly, evolutionary economics translates the principles of evolutionary biology to equivalent processes of economic change as shown in Table 1 (Nelson & Winter, 1982).

**Table 1: Translation of evolutionary biological concepts to evolutionary economic equivalents**

| <b>Evolutionary biology</b> | <b>Evolutionary economics</b> |
|-----------------------------|-------------------------------|
| Inheritance                 | Routines                      |
| Selection                   | Competition                   |
| Variation (mutation)        | Innovation                    |

Whereas biological entities pass on genetic material to their offspring that is inherited over generations, firms pass on *routines* to new employees by means of teaching and imitation. Routines herein refer to proven formal and informal procedures organizations rely on during decision-making, and as such are the primary means by which organizations accomplish their day-to-day activities (Nelson & Winter, 1982). Companies rely on their routines as they operate in an environment where fundamental uncertainty, complexity and change are the norm (Becker & Knudsen, 2005). Due to the proven nature of routines concerning decision-making, firms demonstrate routinized (i.e. risk-avoiding) behavior (Heiner, 1983) and sporadically review these routines (Feldman & Pentland, 2003).

Evolutionary economists argue that the creation of organizational routines can be translated to specific competences unique to every organization, that to a certain extent determine the success of an organization in the long run (Teece, Rumelt, Dosi, & Winter, 1994). Biological organisms go through a process of natural selection as a consequence of the scarce availability of natural resources. Such selection processes also occur in ecosystems, where firms with successful routines (competences) acquire greater market shares or stock valuations compared to less competent firms. The outcome of **competition** between organizations is therefore based on the same selection principle: organizations with superior routines and competences thrive and survive, whereas their less competitive peers lose market share and eventually disappear from the ecosystem (Nelson & Winter, 1982).

Similar to random genetic mutation in evolutionary biology leading to new variation in a population, is **innovation** a new source of variation for organizations. Companies proceed with innovation when their existing routines are threatened by competitors. This is particularly prevalent in hyper competitive industries such as the software industry (Lee et al., 2010), where the technology of today may be the legacy of tomorrow. Innovation is therefore required to prevent organizations from becoming inert, inflexible, or go bankrupt (Feldman & Pentland, 2003).

#### 4.3.2.3 Evolutionary Economics and Ecosystems

One of the primary characteristics of evolutionary economics, is the assumption that actors have both different and imperfect capabilities to process and interpret information acquired by their senses, and that all information is not ubiquitously available (Boschma & Frenken, 2006; Nelson & Winter, 1982). Although actors are assumed to strive for profit maximization even when all information is available to them, the cost and effort of making complex deductions to calculate the most optimal choice does not outweigh the benefits. Agents are thus *bounded in their rationality* (Erbas & Erbas, 2009; Simon, 1955) and will therefore resort to organizational routines (i.e. risk-avoiding behavior).

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The bounded rationality of firms has consequences for the self-organizing nature of an ecosystem (Briscoe et al., 2007). First, since firms often display conservative and risk-avoiding behavior by relying on routines built up over time in an uncertain world (Feldman & Pentland, 2003), firms tend to be blind for other profitable opportunities on unfamiliar terrains. This results in a path-dependent decision-making process, in which existing competences restrict firms in their behavioral freedom

and result in limited adaptability to changes occurring in their ecosystem. Successful software firms are therefore often tied to their existing customers and business models, making it increasingly difficult for firms to change their products or platforms coupled with structural consequences for the ecosystem (Christensen, 1997). An example is the eviction of Nokia from its market-leading position in the mobile phone market. Nokia saw its market share, stock valuation and financial performance suffer, and faced job losses as Apple's iPhone and Google's Android software came to disrupt and dominate the mobile phone ecosystem (Gawer & Cusumano, 2012). It is therefore essential for firms to maintain a wide range of contacts within an ecosystem. Firms must ensure that they do not only establish relationships with contacts that are cognitively proximate when looking for complementary knowledge (reinforcing the tunnel vision leading to lock-ins), but also establish relationships with contacts that are cognitively distant to establish new organizational routines (Boschma, 2005).

Second, next to firms being locked-in because of their fixation on established routines, can *historical events* lead to inferior and sub optimal outcomes for both a firm and other actors in an ecosystem. Historical events are often self-reinforcing and irreversible (Boschma & Frenken, 2006), as it is impossible to reverse time and to make events undo themselves. Due to bounded rationality, firms are largely unable to predict the impact strategic and technical decisions will have in the long run. For instance, organizations creating their own 'platform' are faced with a range of choices concerning its extension architecture such as APIs (application programming interfaces) that are considered to be the most stable part (Baldwin & Woodard, 2009). Once the decision for a particular platform architecture is made, the decision can hardly be reversed. This is where co-evolution and network effects play a major role in two-sided markets such as the mobile ecosystem or video games ecosystem (Rochet & Tirole, 2003). For example, the more third-party developers (platform complementors) engage in niche creation, the more users are attracted due to extended functionalities offered, and vice versa. These network effects tend to reinforce the platform in a cumulative manner, making it increasingly difficult for the platform to be dislodged by competitors. In addition, it becomes near impossible for the architecture to be subject to change after it turns out another alternative decision would have been superior.

Third, *economies of scale* and other practices that form ecosystem *entry barriers* can severely hamper the development of an ecosystem. Examples of such barriers are closed standards or mandatory certification occurring within an ecosystem (Jansen, Finkelstein, et al., 2009). New entrants with innovative ideas are often unable to grow due to preventive measures taken by incumbent influential organizations within the ecosystem that desire to retain their powerful position (Porter, 2008).

### 4.3.3 Innovation in Ecosystems

Most breakthrough innovations do not succeed in isolation without complementary innovations to attract users (Adner, 2006). Studying technological development is central to evolutionary economics (Metcalf, 1994), in which technologies are considered as entities that compete for users. When taking the discussed concepts of evolutionary biology and economics into account, the process of technological evolution can be seen as a chain of experiments with new technology (variation), of

which some will successfully diffuse in an ecosystem whereas others disappear (selection). This process is termed technological substitution, where incumbent technologies get replaced by new technologies (Geels & Schot, 2007). During this process, shifts in market shares and stock valuations are likely to occur, thereby being a part of the structural evolution of the ecosystem. In this section, we will discuss the main causes and their consequences of innovation (mutation) in ecosystems.

#### 4.3.3.1 Defining Innovation

Software firms spend large portions of their revenues on research and development (R&D). One of the primary goals of R&D, is the creation of new intellectual property that can be either tangible (hardware) or intangible (software). Not all R&D projects, however, lead to the realization of new successful technologies. Firms are confronted with bounded rationality when estimating innovation attractiveness, being *“the sum of the novelty of the innovation and the expected future generality of market demand”* (Von Hippel, 2005). In addition, firms are faced with uncertainties whether or not the innovation can be turned into ownership by means of patents and copyright protection (Von Hippel, 2005). Firms with effective and flexible routines (competences) with regard to innovation will outperform other firms in their ecosystem with ineffective and inflexible routines (Feldman & Pentland, 2003). Innovation is therefore the primary source of variation in an ecosystem. The result of differing competences among firms also functions as a selection mechanism, where some firms will eventually be evicted from the ecosystem whereas other firms will sustain or thrive.

In innovation literature, a distinction is made between product and process innovations (Gopalakrishnan & Damanpour, 1997; Utterback & Abernathy, 1975). Within the domain of information technology, we define these two types of innovations as:

- **Product innovation:** Successful development and introduction of a new hardware or software product, technology or service.
- **Process innovation:** Successful application of a new and more efficient production process.

Product innovations involve the successful development and introduction of a new hardware or software product, technology or service. Examples of product innovations are successive product models of the Samsung Galaxy lineup, newer versions of operating system software such as Windows 8, the creation of new open or closed proprietary technology standards, or the creation of a new consultancy service. Process innovations, however, involve the application of new production processes. An example is the implementation of modern software development methods such as Agile or Lean, with the aim of streamlining the software development process to cut development and maintenance costs. In sum: firms compete on product quality through product innovations and compete on minimizing costs through process innovations.

Another prominent distinction made in innovation literature is between radical innovations that establish a new dominant design, and incremental innovations that refine a dominant design (Gopalakrishnan & Damanpour, 1997; Henderson & Clark, 1990). We define these two types of innovations and the term ‘dominant design’ as:

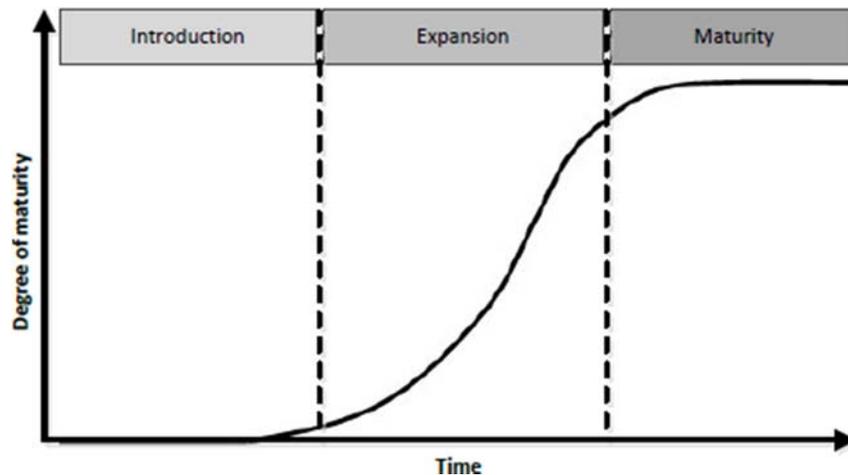
- **Radical innovation:** The establishment of a new dominant design that is embodied in a new software product, technology or service.
- **Incremental innovation:** The refinement and extension of an established dominant design in a software product, technology or service.
- **Dominant design:** De facto technology standard in an ecosystem.

Examples of radical innovations are the introduction of Software-as-a-Service, cloud architectures and their associated delivery models. Another example is the introduction of Apple's iPhone in 2007, that caused a complete restructuring of the mobile phone ecosystem, including major shifts in both horizontal and vertical markets (e.g. mobile network operators, mobile phone manufacturers and mobile application developers) (Holzer & Ondrus, 2011). Radical innovations also come with a new set of core design concepts and principles (i.e. a dominant design) upon which complementary products, technologies or services can be built (Henderson & Clark, 1990).

Examples of incremental innovations are the creation of newer versions of operating system software including novel or improved features such as Apple iOS 7 or Google Android 4.2 Jelly Bean. Niche creators also contribute with incremental innovations with the aim of making a profit while at the same time refining, diversifying and extending a dominant platform (e.g. Windows 8) by means of complementary products, technologies or services (Iansiti & Levien, 2004). The cumulative character of incremental innovations cause the ecosystem to be refined, extended, sustained and grow over time, leading to a '*technological trajectory*' (Dosi, 1982). When the underlying knowledge and routines required by firms in order to complement (i.e. incremental innovations) to the dominant design remain unchanged, we speak of a '*technological paradigm*' (Dosi, 1982). As soon as the dominant design is dislodged and replaced due to the successful introduction of a radical innovation, the technological paradigm ends and is succeeded by a novel paradigm along with its own required knowledge and routines. It should be noted that whereas incremental innovations are generally the consequence of firms having improved their current competences (routines), radical innovations often demand the creation of novel insights, knowledge and routines beyond the existing competences present within organizations (Anderson & Tushman, 1990).

#### 4.3.4 Innovation in Ecosystems

When a radical innovation is introduced, the new dominant software product, technology or service will diffuse among users through 'adoption' in an ecosystem. Although the nature of a radical innovation may vary, the diffusion process tends to follow a similar pattern and has already been studied in-depth (e.g. (Fichman, 2000; Zaffar, Kumar, & Zhao, 2011)). This pattern can be regarded as being an S-shaped (sigmoid) curve, also termed the adoption curve (Rogers, 1995), and is illustrated in Figure 6. As shown in Figure 6, three different phases of the diffusion process can be distinguished, being (1) introduction, (2) expansion and (3) maturity. In this section, we will address each phase and commonly occurring economic mechanisms at play shaping the formation of the ecosystem, including their causes and their consequences.



**Figure 6: S-shaped diffusion process of a radical innovation**

#### 4.3.4.1 Introduction Phase

The first phase in a diffusion process is called the **introduction phase**. The introduction of a radical innovation often occurs when the dominant design of a software product, technology or service from an incumbent leading firm in an ecosystem has matured and perfected through incremental innovations (Feldman & Pentland, 2003). At specific moments, 'windows of opportunity' open to the benefit of new and agile firms with flexible routines (Feldman & Pentland, 2003; Nelson & Winter, 1982). During such occurrences, a radical innovation will first have to 'prove' itself among rivaling radical innovations. Early adopters (regardless of their nature) and (venture capital) investors are of key importance to generate an initial user base and to fuel manufacturing and marketing processes (Rogers, 1995). The availability of such resources is crucial during early moments of fierce competition and may give specific variants a head-start over less favored peers, regardless of the quality of the competing innovations that remains largely unknown by investors and users due to bounded rationality (Simon, 1955).

During the introduction phase, radical innovators battle for the dominance and establishment of their design. The establishment is often the consequence of self-organizing economic mechanisms such as *increasing returns*, *technological lock-ins* and *switching costs* (Arthur, 1989). For instance, an increasing amount of customers that commit themselves to a product, technology or service during the introduction phase will serve as bait for niche creators (Iansiti & Levien, 2004). The greater the amount of users, the greater the amount of attracted third-party firms will be (Rochet & Tirole, 2003). This increase in the amount of third-party firms extending the product, technology or service upon which they build in turn attracts more users, while at the same time refining the design and solidifying the position of the radical innovator (also termed increasing returns to adoption). With regard to the latter, particularly the technological lock-in mechanism is prevalent. When a lock-in occurs, users become dependent on the software product, technology or service delivered by the radical innovator. Users are then unable to use the software products, technologies or services provided by competitors without facing *switching costs* (i.e. forced duplication of investments) (Farrel & Klemperer, 2007). Examples of switching costs in the software industry are nontransferable app store purchases between Apple's iOS, Google's Android and Nokia's Symbian, or interoperability

and incompatibility issues between Microsoft Windows and Apple Mac OS (Chen & Forman, 2006). In addition, coupled with the retention of users due to lock-ins, do successful radical innovators enjoy economic benefits: the greater the amount of users, the lower the production costs tend to be due to economies of scale and other network-effects boosting the adoption rate of their introduced innovation (Rochet & Tirole, 2003).

An increasing and sufficient user base (i.e. critical mass) coupled with the refinement and extension of a design leads to the establishment of the new dominant design in an ecosystem (Henderson & Clark, 1990). This is a turning point and decisive moment in the diffusion process, where only one or a couple of variants make their way into the *expansion phase*. This occurs at the cost of other variants that will eventually either have to adopt the dominant design established by the winning radical innovator (with the consequence of lagging behind), or get evicted from the ecosystem triggering structural change.

#### 4.3.4.2 Expansion Phase

As soon as an ecosystem transitions into the *expansion phase* along with a selected group of radical innovators, competition remains fierce and subject to self-organizing economic mechanisms (Rogers, 1995). When one or multiple dominant designs have been established, however, firms will increasingly compete through process innovations (Cohen & Klepper, 1996; Utterback & Abernathy, 1975). Since the dominant design has become the de facto technology standard in the ecosystem along with its set of core design concepts and principles (Henderson & Clark, 1990), will process innovations allow firms to attain production efficiency and cost reduction. Firms also continue to compete through product innovation, however, and introduce newer versions of their products, technologies or services to achieve differentiation, quality improvements and niche exploitation (Faria & Lima, 2009). Niche creators remain influential players in the ecosystem by means of refining and extending the dominant design(s) through incremental innovations.

During the expansion phase, the consequences of the established dominant design will become clear. Although in the meanwhile incremental innovations have refined and complemented the dominant design, it may turn out that the established dominant design is *sub-optimal* compared to earlier designs introduced by rivaling firms (Arthur, 1994). Because of bounded rationality and chance events, the established dominant design need not necessarily be superior to all its former rivaling designs. Despite the sub-optimal outcome of the initial selection process that was not known beforehand, are dominating firms often reluctant to review their established dominant designs due to the unwillingness to cannibalize their own prior investments and assets (Cravens, Piercy, & Low, 2002). In addition, niche creators already reinforced the position of the new dominant design in a cumulative manner by means of co-evolution through refinement and extensions (Iansiti & Levien, 2004). This advance is an example of *path dependence*, where an ecosystem gets locked in one or a couple of succeeding variants and thereby ignoring other options due to a focus on short and medium term growth (Arthur, 1989). Historical events that occurred during the introduction phase thus have a lasting and directing influence on the development of the ecosystem, making historical sub-optimal choices and outcomes practically *irreversible*. Even almost negligible and *unpredictable*

differences in for instance the amount of early adopters can be of major influence during the selection process during the introduction phase (Arthur, 1989).

#### 4.3.4.3 Maturity Phase

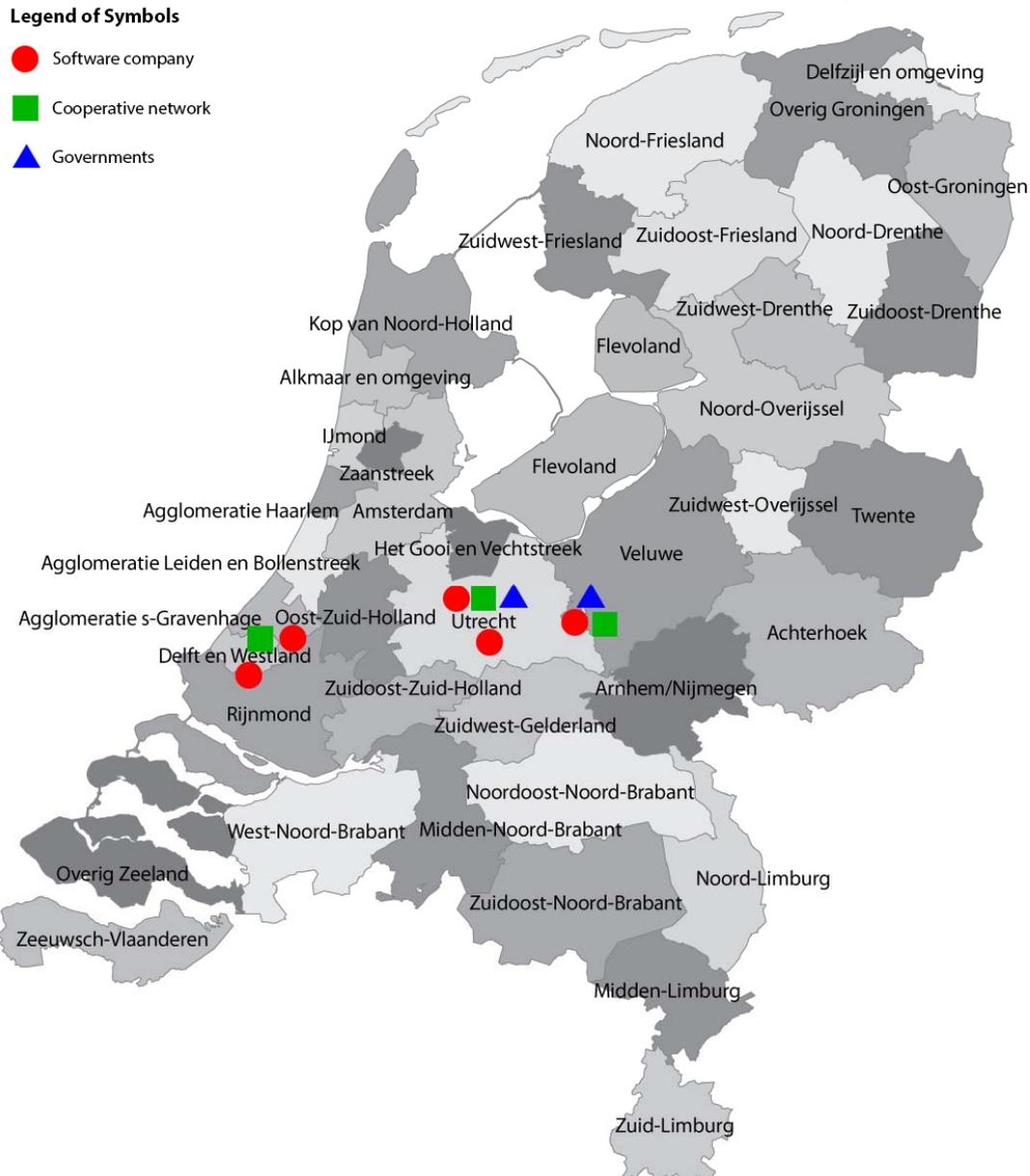
As the dominant design of a product, technology or service matures, the rate of process and product innovations will slowly come to a halt (Arthur, 1989; Utterback & Abernathy, 1975). During the **maturity phase** of the ecosystem, the technical potential to further improve a dominant design decreases, while the market demand saturates and the innovation diffusion process stops (Rogers, 1995). Only a small amount of firms with perfected routines survive the selection process and emerge as the eventual ecosystem dominators (oligopolists), leading to an *oligopolistic ecosystem structure* (Klepper, 1996). During the maturity phase, it is likely windows of opportunity in the ecosystem will open again for radical innovators aiming to establish a new dominant design. Although incumbent oligopolists may introduce radical innovations themselves, they tend to experience great difficulties due to the requirement of new knowledge and routines since existing routines do not suffice (Anderson & Tushman, 1990; Feldman & Pentland, 2003). When a new battle among competing firms for the establishment of a new dominant design commences, the ecosystem will enter a stage of self-renewal (Moore, 1993). The diffusion processes of radical innovations in an ecosystem are likely to be repeated following the S-shaped curve as illustrated in Figure 6 where incumbent firms will be challenged, and new entrants vie for dominance – again altering the structure of the ecosystem.

## 5 Case Study Results

In order to be able to answer sub research questions 4 and 5 (see Section 2.1), multiple case studies by means of semi-structured interviews were conducted with different stakeholders in the Dutch software industry. The goal of these case studies was twofold. First, insight was required in the current perception software companies and cooperative networks have regarding business, educational and governmental partnering within regional software ecosystems, and how this could be improved. The second goal was to interview governmental representatives to acquire their perception on the product software industry present within their region and their motivations for governmental involvement in the software industry. In total, three case studies were conducted with regional cooperative networks, five case studies were conducted with Dutch product software companies, and two case studies were conducted with governmental representatives. During each separate case study, one or more interviewees of the participating cooperative network, software company or governmental institution visited were present. Several case study participants were contacted multiple times after the interviews had been conducted to validate interpretations in case answers given by the participants turned out to be either unclear or ambiguous. Furthermore, different interview protocols were created for every type of stakeholder that took part in the case studies. An overview of how these interview protocols were designed and the way in which the case studies were conducted can be found in Section 3.2.

The selected case study participants are located in three different COROP-regions (formally defined regions used for analytical purposes by e.g. official governmental institutions) as shown in Figure 7. The regions that were subject of study concern the Delft and Westland COROP-region (including part of the Oost-Zuid-Holland COROP-region), the Utrecht COROP-region and the Veluwe COROP-region. These locations were deliberately chosen to allow for a bottom-up study and to be able to perform a cross-stakeholder analysis (e.g. between software companies and governmental representatives) within these regions. However, it has to be taken into account that actors and their actions are rarely bound to their geographical location. A software company located on the borderline between two formally defined COROP-regions may very well partner with another company on the other side of the borderline. This regional interpretative dimension can therefore be considered a mere caricature of the real world. However, laws and actions of governing organizations self-evidently have limited political power that can only be exerted within their own political region. Making use of a COROP-region perspective is therefore suitable to demarcate their region of influence.

The remainder of this section continues with a description of the main findings from the case study interviews conducted. Separate subsections describe the results of the different stakeholders interviewed. In addition, within these subsections, every case study is separately presented. Quotes taken from the audio recordings have been placed between quotation marks, and are denoted in *italics*. To connect multiple relevant quotations or parts thereof, an [...] symbol was inserted to signal to the reader that either a part of the quotation was left out, or when two quotations were glued together. Every quotation also has a unique identifier (e.g. IGOV9) that serves as a reference anchor whenever a given quote is used elsewhere in this document. A full overview of these identifiers can be found in Appendix H. Furthermore, interesting topics discussed are denoted in **bold**.



**Figure 7: Overview of geographical locations of case study participants**

## 5.1 Cooperative Networks

Software companies frequently organize themselves in dedicated cooperative networks, in search for mutually beneficial expertise and specialized knowledge possessed by peer software companies located within their region. As such, cooperative networks have the ability to stimulate and facilitate collaboration between software companies and therefore have a high-level overview of opportunities and issues grasped and tackled by software companies in their region. In other words, cooperative networks can be regarded as central players within a larger network of (product) software companies in a region and play a pivotal role in connecting companies by means of e.g. facilitating knowledge exchange or initiating partnerships within regions.

The interview protocol in Appendix D served as a guide during the interviews. The first set of questions are directed at the organizational aspects of the cooperative networks. This includes general information such as the year of establishment, the amount of members, the role of the interviewees, what kind of software companies are a member and the nature of the activities organized. Afterwards, regional aspects such as the perceived degree of partnering by software companies within the region are discussed, followed by specific attention devoted to the role governments and research and educational institutions fulfill within the region.

### 5.1.1 CoopFoodValley –Veluwe / Utrecht Region (Food Valley)

CoopFoodValley is a collaboration between ICT companies located on the borderline between the COROP-regions Veluwe and Utrecht, and is often informally referred to as the Food Valley. This latter region comprises the municipalities of Barneveld, Ede, Nijkerk, Renswoude, Rhenen, Scherpenzeel, Veenendaal and Wageningen. According to the interviewee, the **primary goal** of CoopFoodValley is *“to stimulate collaboration and knowledge exchange in the Food Valley by connecting ICT companies, research and educational institutions, companies with an interest in ICT, and those working in the ICT industry (ICOOP1).”* A wide array of software companies are a **member** of CoopFoodValley, ranging from small product software companies to self-employed web developers. The network is **growing steadily** and **enjoys widespread support** from both the companies located within the region as well as the municipalities (primarily the municipality of Veenendaal, the main sponsor of CoopFoodValley). An overview of interesting statistics about CoopFoodValley can be found in **Fout!**  
**Verwijzingsbron niet gevonden..**

**Table 2: General statistics about CoopFoodValley**

|                              |  |
|------------------------------|--|
| <i>Name</i>                  | <b>CoopFoodValley</b>  |
| <i>HQ Location</i>           | Veenendaal   |
| <i>Region served</i>         | Food Valley (Barneveld, Ede, Nijkerk, Renswoude, Rhenen, Scherpenzeel, Veenendaal, Wageningen) |
| <i>Member count</i>          | 68 software companies registered as ‘participating organization’. FinComp number unknown.      |
| <i>Year of Establishment</i> | 2012 (Re-established)  |
| <i>Interviewee role</i>      | Chairman supervisory board   |

CoopFoodValley organizes a variety of **activities and events** to support the IT industry in the Food Valley. Several prominent activities of CoopFoodValley, next to facilitating networking and knowledge exchange, are the posting and fulfillment of vacancies provided by members, facilitating the outplacement process of employees when members are confronted with lay-offs or reorganizations, facilitating temporary employment when members experience a decline in customers and projects, and the posting and fulfillment of internship opportunities. In addition, CoopFoodValley also aims to bring investors and ICT start-ups (or other ICT companies) together, and

strongly supports the '(ICT) Discovery' concept that aims to capture the interests of younger generations to work in a technological sector such as the ICT industry.

#### 5.1.1.1 Regional Collaboration

The interviewee argued that the Food Valley has several inherent **regional advantages** over other regions in the Netherlands when it comes regional collaboration and the atmosphere. *"I experience the mentality and work ethic of the people living and working here to be different than in other parts of the Netherlands. They are eager to work, even during weekends when we experience busy times. People here seem to be more involved with the company they work for (ICOOP2)."* In addition, the interviewee indicated that the Food Valley region has *"a great plurality of companies that sparks collaboration and interaction, contrary to regions such as Utrecht where a small amount of monolithic companies dominate the landscape. [...] This plurality comes with labor mobility and the exchange of knowledge, contributing to economic development"* (ICOOP3). The infrastructure within the region is also mentioned as an advantage, being that *"you can get from A to B relatively quick here due to our central location in the Netherlands and excellent road and railway connections. We also see an increasing influx from (people living in, red.) German towns just across the border with whom our municipality maintains excellent ties"* (ICOOP4).

An issue experienced within the Food Valley, is that software companies tend to be **unaware of the existence of other software companies** within their region. *"They do not see the benefits of it (to examine the presence of peer companies, red.). Performing their day-to-day business activities is their top priority, and demands nearly all of a company's efforts. [...] Besides, what would be the effort of partnering in the software industry be, aside from knowledge exchange? Companies in the agricultural sector could share expensive machines. But software companies? There is an abundance of skilled and relatively cheap self-employed people who are available upon request!"* (ICOOP5). In sum, the interviewee argued that there is **no insight** into what companies are located within the region and what expertise they have to offer, combined with little interest in collaboration due to a lack of perceived benefits.

Despite the lack of perceived benefits of collaboration between ICT companies located within the Food Valley, are ICT companies **eager to partner up** with non-ICT companies to whom they could sell their goods and services. *"In many cases, our regional ICT industry delivers a great amount of complementary goods and services to agricultural firms present within the Food Valley. Here you can see an interesting self-reinforcing cycle going on, being that the better the match between the goods and services delivered by ICT companies, the greater the amount of investments will be in the future due to increased success of their customers"* (ICOOP6).

Although the interviewee argued that benefits of regional collaboration are often limited, is the **scaling up of business and political activity** regarded as an opportunity. For instance, *"the increasing influence from the European Union could be seen as an opportunity. It presents companies with more opportunities, for instance to sell their software or provide consultancy services in other member*

states. However, we have to be careful since scaling up business activities often does not go without risks” (ICOOP7).

### 5.1.1.2 Regional Government

The interviewee indicated that **“contact with the government occurs in an ad-hoc manner”** (ICOOP8). There are no dedicated communication channels, and the government does not steer the industry in a specific direction. The government does, however, pay attention to the ICT industry when it comes to regional economic policy. Despite this ad-hoc communication style, the interviewee indicated that the regional IT industry is far from being ignored by the government: *“The government pays attention to our industry and has an open attitude when it comes to communicating interests. Common ground, however, is frequently lacking. [...] Companies and governments are never singing from the same hymn-sheet”* (ICOOP9). When asked for a potential clarification, the interviewee argued that **limited knowledge by governmental representatives** on the regional ICT industry is a hampering factor. *“Governmental representatives rarely have knowledge about our industry and our activities and therefore do not understand the challenges ICT companies within our region experience. On the other hand, however, I notice that companies care little about interaction with the government and their desires. This results in an incongruence of interests. [...] There is a light-year distance between the intentions of an alderman and a company”* (ICOOP10).

When asked on **how to bring governmental representatives and the regional IT industry closer together**, the interviewee replied that *“that is impossible to solve. I am confident that even initiatives that enjoy widespread support such as the Regional Economic Board in Utrecht (aiming to bring industries and the government closer together, red.) will fail in the long run. Influential people such as directors will most likely be present during the first one or two meetings. Afterwards, they will send low-level representatives since they want to see immediate results that often take a long time to be noticeable”* (ICOOP11).

With regard to **what regional governments could do to improve their current role**, the interviewee stated that governments should *“facilitate more. Take good care of the technical infrastructure such as installing a future-proof fiberglass network”* (ICOOP12). In general, however, the interviewee did not see much potential for governmental involvement. *“The government operates in an inward-looking manner. There are no civil servants who are able to understand the needs of the industry and translate that into concrete opportunities for which the government could provide assistance. It is unrealistic to assume this can be changed”* (ICOOP13).“

The interviewee also argued that there is a **difference between the intentions** of the national government and the regional governments. *“Centralization tends to be more efficient due to increased working power, although decentralization is more effective. Decentralized government has more insight in local needs and has direct vision on the playing field, although this is paired with increased costs. The national government should therefore be cautious and weigh up the pros and cons when it comes to decentralization and deregulation. It is hard to tell which variant would be the*

*most optimal. Probably a combination would be the best option to mitigate the associated risks.” (ICOOP14).*

### 5.1.1.3 Research & Educational Institutions

The Wageningen UR (University & Research centre) fulfills a **central role** in the regional economic landscape. Highly specialized and complementary research is often conducted on subjects related to agriculture. To explore the possibilities of collaboration between the regional ICT industry and the Wageningen UR, an event called the “ICT market place FoodValley” was organized in November 2012. During this networking event, the Wageningen UR presented several of its ongoing research projects to see which of these projects matched with the needs of companies located in the municipality of Veenendaal. In addition, governmental representatives of the municipality of Veenendaal such as the alderman of economic affairs were also present to discuss among others trends in the Food Valley and the ICT industry, and to see how collaboration between ICT companies and agricultural firms could be stimulated.

Next to such networking events, do CoopFoodValley and regional ICT companies partner up to create educational programs to address a lack of well-educated graduates with matching skillsets demanded by ICT companies within the region. According to the interviewee, *“there is a need for well-educated employees – even when speaking of less specialized functions such as system administrators. ICT companies and educational institutions are therefore working on a joint initiative to offer associate degree programs to students who would like to both increase their chances on the labor market, while at the same time addressing the deficiencies experienced by ICT companies.” (ICOOP15).*

### 5.1.2 CoopUtrecht – Utrecht Region

CoopUtrecht was founded in 2002 after the regional government of Utrecht decided it would be of value to have a dedicated business network for the regional ICT sector. The **initial aim** was to connect ICT companies to increase their exposure and exchange knowledge. To date, this remains to be the core competence of CoopUtrecht. Although CoopUtrecht was founded with financial aid from the government, it is now **privately owned** by one person who also runs the network. CoopUtrecht deliberately does **not utilize a membership model**. The interviewee argued that *“membership leads to two distinct categories: those who are members and those who are not. I want any company to be able to approach me, not just a select group of companies. As a result, I also have unrestricted movement as for what I both can and want to do.” (ICOOP16).* This is relevant for the **primary purpose** of the network, being to *“bring companies in contact with each other on a management level. In the past, we used to have no idea who was located where and what expertise was offered by those parties. We still experience this as a problem, although we gain insight through networking events and activities.” (ICOOP17).*

The interviewee estimates that the **amount of core-IT contacts** CoopUtrecht maintains an active relationship with is approximately 500. In addition, there are 30 ‘participants’ that are not dedicated

IT companies, but contribute knowledge and bring financial capital into the network. In return, the participants have access to the network of CoopUtrecht. The network is **growing steadily** since its year of establishment in 2002 and its efforts are praised by both the industry as well as the government. An overview of interesting statistics about CoopUtrecht can be found in Table 3.

**Table 3: General statistics about CoopUtrecht**

|                              |   |
|------------------------------|---|
| <i>Name</i>                  | <b>CoopUtrecht</b>                                  |
| <i>HQ Location</i>           | Utrecht   |
| <i>Region served</i>         | Municipality of Utrecht and adjacent municipalities |
| <i>Member count</i>          | No membership required; free access                 |
| <i>Year of Establishment</i> | 2002  |
| <i>Interviewee role</i>      | Founder and owner                                   |

### 5.1.2.1 Regional Collaboration

According to the interviewee, **geographical proximity is of little importance** when it comes to collaboration among companies. *“The quality of a product or service is strongly favored over the geographical proximity of a potential partner when it comes to collaboration. Besides, the Netherlands is rather small in size. Whether a potential partner is located in Utrecht or Groningen, it matters little.”* (ICOOP18). The interviewee also noted that collaboration in the IT industry is of little added value: *“When you work in a high-tech sector such as the biomedical industry where research facilities are expensive, it makes sense to collaborate in order to reduce costs and at the same time benefit from mutually applicable expertise. In the software industry, however, this is almost non-existent.”* (ICOOP19).

CoopUtrecht aims to stimulate **regional collaboration** through *“organizing events such as workshops, seminars, roundtable discussions and master classes.”* (ICOOP20). Last year approximately 40 of such events were held. *“Due to the open and accessible nature of the network, companies more easily approach us to get a taste of what it is like”.* (ICOOP21). In order to get companies to collaborate, companies have to know who is located where and what products or services are offered at these locations. *“When the latter is known and companies become acquainted, the ball usually starts rolling. First you get to know each other, then you learn to trust each other, then the time comes to do business. Findability of companies is still a big issue, however, even after 11 years when CoopUtrecht was founded! [...] If we ourselves as an industry have no idea where we are and what we do, it is not unthinkable that the government experiences even greater problems than we do when it comes to having insight in our industry”.* (ICOOP22).

### 5.1.2.2 Regional Government

Software companies are easily poised to move to different locations outside of their current region in the search for benefits. The interviewee strongly emphasizes that *“since the Netherlands is a rather small country, regional governments should focus on attracting and retaining entrepreneurs in the*

*earliest phases of their development to make them stay in the long run. If companies are looking for e.g. skilled employees or a stimulating and dynamic environment, they won't hesitate to move to another region. It is therefore, in my opinion, paramount to prevent such companies from moving away." (ICOOP23).*

When asked about the **regional economic policy** formulated and executed by regional governments and the role of IT herein, the interviewee states that *"the Task Force Innovatie Regio Utrecht (an organization that highlights innovation in branches of industry that currently gain limited attention, and aims to help innovative sectors to achieve further growth, red.) just did not want to recognize the presence of IT in our economic landscape." (ICOOP24).* There was great anger among ICT companies within this region that the value of our industry would not be recognized. *"They just have absolutely no clue what our regional economy looks like". (ICOOP25).* As a reaction to this widespread criticism, another initiative called the Regional Economic Board Utrecht was brought to life to address this deficiency. *"When TNO (Netherlands Organization for Applied Scientific Research, red.) performed an investigation (ordered by the Regional Economic Board Utrecht, red.) to gain insight into our regional economic landscape, an undisputed conclusion was that our IT sector was of utmost importance when it comes to regional job creation and economic contribution." [...] "Research showed that the value of our IT industry was indeed not recognized. Apparently, our industry is not sexy enough compared to life sciences and design. The government has a hard time figuring out what we actually do." (ICOOP26).*

When discussing the **attitude of regional governments**, the interviewee indicated to signal an ever greater shift towards reactive behavior with pitiable consequences. *"Apparently the government doesn't just lack interest for our industry. They also have to cope with ignorance and inexperience. It is mission impossible to find someone out of all the approximately 700 civil servants working for our province who possesses knowledge about our industry. The same holds for the Chamber of Commerce." (ICOOP27).* When asked whether the interviewee could think of any possible solutions, the recommendation was to *"look for alternatives where government and the industry do not have to directly deal with one another. Perhaps the Regional Economic Board Utrecht will show some initial successes, but I expect this success will be limited to individual projects. You do have to start somewhere, however." (ICOOP28).*

The criticism of the interviewee towards the government is not solely limited to the lack of attention it has for the regional software industry. Another problem experienced is *"the **competition for similar industries** between regions that is utmost pointless." (ICOOP29).* Contrary to working together, the interviewee signals *"an everlasting contest where every region aims to be victorious over their peers. The municipalities of Utrecht and Amersfoort both enjoy the presence of a thriving gaming industry. However, instead of collaborating to achieve networking effects and a more powerful industry overall, both municipalities want to emerge as the sole victor." (ICOOP30).* The interviewee considers this a waste of economic and social opportunities and emphasizes value is to be found in the complementarity between regions, rather than rivalry.

Despite the flow of criticism, the interviewee also shows **understanding of the difficulties regional governments face** when judging industries on their economic value and contribution. *"When you*

*look at the Brainport Eindhoven region, everyone agrees that the regional economic policy carried out is working out wonderful.” (ICOOP31). When asked what makes this regional economic policy so successful, the interviewee could not think of one major deciding factor. When it comes to assumptions, however, the interviewee assumes that its success could be contributed to the “relative uniformity of the industry in that region. The Brainport region is a cluster of high-tech companies such as ASML, NXP and Philips. Apparently the government goes all-in on those high-tech clusters, which results in an unparalleled success. On the other hand, a more diverse industry such as ours in Utrecht has the advantage of being shock-resistant. When one type of industry experiences a downturn, other industries may still flourish.” (ICOOP32).*

Finally, the interviewee argues that software companies “*should never rely on regional governments to assist them, nor to undertake action. However, it most definitely is part of the responsibility of regional governments to look after industries present within their region.*” (ICOOP33). The interviewee mentions that the latter is “*exactly what the current problem is all about. They have no knowledge and do not understand our industry, nor do they possess the capability to effectively communicate with us to see how our industry can be supported and improved.*” (ICOOP34). One particular advice given by the interviewee directed at regional governments, is to “*Stop wasting time on time-consuming activities. Instead, venture into the region and see what our industry is like and then determine how it can be improved. It will be an eye-opener!*” (ICOOP35).

### 5.1.2.3 Research and Educational Institutions

Research and educational institutions are judged to **contribute little** to the regional economic development of the IT sector within the region of Utrecht. The interviewee again stated that “*geographical proximity plays no role when you have been educated in Utrecht, and get offered a job you like in Amsterdam. In fact, it is not even necessary to move.*” (ICOOP36). The interviewee argued that the presence of research and educational institutions matters little and that “*the real strength of this region lies in its central location within the Netherlands*”. (ICOOP37).

When it comes to the **approachability** of research and educational institutions, the interviewee rated this as “*deplorable*”. “*It always comes down to companies blaming universities, and universities blaming companies. There exists no synergy between these two worlds. To make things more ironic, governments often shout from the rooftops that their labor force is among the most well-educated in the world. Although this may be true from a statistical perspective, the skills of recent graduates just do not match with what is needed in the industry.*” (ICOOP38). When asked for clarification, the interviewee argued that the **skills and competence levels of recent graduates** is dramatic compared to those already at work in the industry. “*What we experience is that companies usually first have to educate new employees – who already followed a relevant Bachelor’s or Master’s program – for an additional approximately six years to fully master the skills they need to perform their job well.*” (ICOOP39). As a consequence, a group of software companies is now exploring the possibility of creating an educational trajectory where graduates can work on large-scale projects at connected companies. The aim of this trajectory is to let graduates gain hands-on experience, while at the same time being taught additional material that can be directly applied in their day-to-day work in the

industry. “Apparently, the gap between theory and practice is currently too great. We are therefore trying to bridge this gap by coming up with innovative solutions.” (ICOOP40).

### 5.1.3 CoopDelft – Delft Region

CoopDelft is a **network of Delft ICT companies** that together deliver a wide array of products and services related to ICT. The **background** of those companies is diverse, ranging from self-employed web designers and interim managers to large internationally operating product software companies. In addition, CoopDelft also welcomes non-ICT organizations (named sympathizers) that deliver complementary goods or services to ICT companies, of which banks and law offices specialized in ICT-related matters are examples. A major distinction between ordinary members and sympathizers, however, is that the latter group does not have voting rights. The **primary focus** of CoopDelft, according to the interviewee, lies on “organizing formal and informal events with the purpose of companies getting to (better, red.) know each other from both a geographical perspective (location, red.) as well as the products and services offered (expertise, red.)” (ICOOP41). CoopDelft has approximately 150 **members**, with an estimated **target audience** of 4,000 people.

CoopDelft is a member of Profiel-015, a broader initiative in the region Delft that facilitates a network of collaborating ICT companies and organizations in Delft. By **bundling the powers** of entrepreneurs, researchers, educators and the government, Profiel-015 aims to **realize an optimal climate** that enables Delft companies to tackle any ICT-related case that may surface within the region. Among the members of Profiel-015 are the Delft University of Technology (researchers and educators), TNO Information and Communication Technology (researchers), CoopDelft (practitioners), and the municipality of Delft (governmental representatives). Gatherings are organized on a routine basis to which representatives from all the aforementioned categories are invited. By means of these gatherings, researchers, educators, practitioners and governmental representatives exchange knowledge and opinions on what would be the best course of action by the aforementioned parties to **stronger position the region Delft** from both a national as well as international perspective. An overview of interesting statistics about CoopDelft can be found in Table 4.

**Table 4: General statistics about CoopDelft**

|                              |                       |
|------------------------------|-----------------------|
| <i>Name</i>                  | <b>CoopDelft</b>      |
| <i>HQ Location</i>           | Delft                 |
| <i>Region served</i>         | Municipality of Delft |
| <i>Member count</i>          | 150                   |
| <i>Year of Establishment</i> | 2003                  |
| <i>Interviewee role</i>      | Chairman              |

### 5.1.3.1 Regional Collaboration

When the interviewee was asked about the **status of regional collaboration** within the region of Delft, the interviewee immediately addressed a complicating factor: **findability**. *“When you look at the economy in Delft, it is clear that our ICT sector is the most prominent. However, nobody has a single clue on who does what, and where to find the expertise present within this region.” (ICOOP42)*. An example provided by the interviewee was that the municipality of The Hague wanted to find an ICT solution to combat problems caused by loiters. *“Despite significant efforts, The Hague was unable to find such a company in our region. But we do know it exists. This is just one example to show that we do not utilize our full potential as in industry. [...] First you have to know what (expertise, red.) is located where, and only then can you link actors to each other.” (ICOOP43)*. To address this issue of findability, CoopDelft now collaborates with another organization named the Kennisalliantie (Knowledge Alliance). The Kennisalliantie operates on a higher scope level (the province of South Holland) and aims to connect entrepreneurs with research, education and the government to promote knowledge exchange and mutual understanding – thereby augmenting competitive power of the region. Similarities can be seen with the Regional Economic Board Utrecht that also functions as a link between the various stakeholders involved. Other attempts were made to address the issue of findability in the Region Delft of which none have been successful so far. For instance, the interviewee mentioned that *“utilizing data provided by the Chamber of Commerce turned out to be utmost useless. For instance, their records say nothing about for what kind of domain a software development company produces its applications. It is unknown what kind of expertise companies deliver, what the quality is of their goods and services offered, their reputation, and so forth. In other words: the data proved to be too shallow in terms of information richness. Again, you want to have an in-depth view and gain insight into who is located where, and what expertise is present at these locations.” (ICOOP44)*.

To see how the **collaboration in the Delft ICT industry** could be stimulated, a trip to Silicon Valley was organized in 2008. The traveling party consisted of 25 entrepreneurs, the responsible alderman of economic affairs, two directors of TNO, the dean of the faculty of Elektrotechniek, Wiskunde en Informatica (electrical engineering, mathematics and informatics) of the Delft University of Technology, and the director of the ICT Delft Research Centre. *“We visited successful incubators and large companies, and were able to speak with big investment companies and the local ICT group (Software Developers Forum, red.) to see what we could learn from them. In short, we figured out that the only way to grow and promote collaboration is to **increase in scale**. Right now, our regional networks such as CoopDelft are run by volunteers. If we were to partner up with the municipalities of Leiden, Zoetermeer, and then to an even greater scale level such as Rotterdam and The Hague, we would make an immense leap forward in terms of professionalization.” (ICOOP45)*. In other words, CoopDelft is now seeking to achieve this process of **scaling up** their activities to a higher level by partnering up with adjacent regions. It aims to go from a voluntary network to a professional network with the guarantee of continuity and quality.

### 5.1.3.2 Regional Government

Despite great interests from CoopDelft and ICT companies located within the region, the **regional government seems less interested** in profiting from the benefits of economies of scale. *“After we conducted the trip to Silicon Valley, we jointly wrote a vision document for the government on how to tackle the challenges our industry is facing. But what happened? They did not even pay some serious attention to it. It was basically thrown into the trashcan. This sparked anger in our industry and resulted in the opposite effect of what was hoped to achieve.” (ICOOP46).*

When asked on **what the regional government could do better** when it comes to defining regional policies, the interviewee came with a clear message: *“have a more liberal attitude! Stop reinventing the wheel countless times over and over again. And please stop this bloody tendering process that is horribly inefficient. If the government would like to support our industry and promote Delft as an ICT-city, my advice would be to go out in the open and talk to knowledgeable people about what could be achieved with the expertise present within your own city. They are always welcome to approach me and ask whether they could exchange some thoughts with influential people on how to better position ICT within our city. We have abundant knowledge on this topic, so why not benefit from it? We have offered our input multiple times, but all attempts were in no avail.” (ICOOP47).*

The interviewee was not satisfied with **the way in which the government maintains relationships with the ICT industry**. *“If you want to get something done with the government, you truly have to have a long breath and an abundance of patience. It may take well up to several years to get anything done. The ability of the regional government to concentrate shows similarities with that of a toddler. They just can’t stay focused on something they are working on, whereas this focus is demanded from the industry. As such, it actually is a paradox.” (ICOOP48).* When asked whether the Regional Economic Board Utrecht could serve as a model for the region Delft to increase cooperation among all stakeholders, the interviewee answered in favor of such a solution. The interviewee is curious whether the initiative will succeed, but is afraid that influential members such as directors from industry will eventually send low-level representatives due to the long times it takes before a success becomes apparent. The interviewee argued that employees of cooperative networks akin to CoopDelft and CoopUtrecht could serve as intermediaries due to their extensive contact with the industry.

Another problem experienced when it comes to regional economic policy formulated by the regional government, is the **amount of financial capital available** to support the Delft ICT industry. *“If you take a look at the ‘topsectorenbeleid’ (designated industrial sectors favored over others due to their alleged impact on the economy of the Netherlands, red.) , you will notice that every other random type of industry receives millions of euros to spark innovation. Our ICT industry is never in such a spotlight. For some reason, the local government lacks ambition as well – especially when you realize how many ICT companies are present within this region and the prominence the industry has within the regional economic landscape.” (ICOOP49).* One possible cause given was the **failing interaction** between the government and stakeholders from the ICT industry. *“When I look at the creative industry that includes for instance architecture, design and gaming, the collaboration between the industry and the regional government seems to be superb. It is almost surreal. Every*

*person involved seems to be rapturously enthusiastic. Then I ask myself: what do we do wrong? I firmly believe our **industry lacks essential communication skills, and so does the regional government**. Software is difficult to grasp as it is largely intangible compared with other types of products. Governmental representatives are generally only familiar with using ICT for their own means compared to producing ICT – which is what we do. Next to that, the type of people working in the ICT industry are also just less communicative than their peers in other industries. Most of the communication toward and from the government occurs on a personal and individual basis. If you happen to speak with a timid programmer, you can imagine that this makes communication between our industry and the regional government even more difficult.” (ICOOP50).*

To attract more attention from the regional government and to gain increasing interest, the perceived solution by the interviewee again lies in **scaling up the ICT industry**. *“If our ICT industry would like to gain more speaking volume in terms of capacity for action and thrusting power, we should really seek to collaborate on a higher level (greater geographical scale, red.). As a consequence, we would have more of everything such as manpower and financial capital. This will automatically make our industry a more interesting party to do business with.” (ICOOP51).*

### 5.1.3.3 Research & Educational Institutions

To facilitate the exchange of knowledge and to promote collaboration between companies and research and educational institutions, CoopDelft regularly **organizes networking events**. Every networking event addresses a specific theme and attempts to uncover potential collaboration opportunities between ICT companies, TNO, and Delft University of Technology. To promote such opportunities, a group of volunteers from companies and research and educational institutions arose, termed the “special interest group”. The latter group aims to achieve support from a wider audience, by looking for potential partners (both ICT and non-ICT companies) who could deliver added value to collaboration projects. Such projects are not bound to the region Delft. Instead, the group actively seeks to collaborate on a larger scale by involving other third-parties such as the Kennisalliantie as formerly discussed. Members of the Kennisalliantie are welcome at every training and networking event, and vice versa. The interviewee calls this a *“cross-fertilization of multiple disciplines and stakeholders to spark ideas and economic growth.” (ICOOP52).*

According to the interviewee, Delft has the highest concentration of research and educational institutions in the Netherlands. Despite this concentration, the interviewee argued that the Delft University of Technology is often **reluctant to collaborate** on joint opportunities. *“We have excellent researchers and educators working at research and educational institutions such as the Delft University of Technology and TNO. Yet we experience it to be an arduous task to get these people out of their offices and have them take a look at what we are doing. [...] We see so many opportunities to collaborate, yet they show little interest. This shows the painful truth that such institutions are and will most likely always remain governmental institutions: there is an **absence of pressure to achieve successes**, which is the primary goal that companies have.” (ICOOP53).* The interviewee is also discerned about the **amount of financial capital** allotted to research in ICT. *“Great amounts of financial capital are invested in this region to finance research and educational institutions. The bitter*

*truth is, however, that almost none is allotted to research in ICT. The creative industry and high-tech companies focusing on, for instance, nanomaterial, walk away with all the cash. For some reason, research in ICT just does not seem hot enough for the government. I find this **unfair**, particularly if you consider the dominant role the ICT industry plays in our regional economy.” (ICOOP54).*

Last but not least, the interviewee mentioned that regional collaboration between the ICT industry and research and educational institutions exists through the generation of **spin-offs**. *“Many spin-offs are launched from the Delft University of Technology each year. Many companies and other stakeholders are usually willing to support these spin-offs, as they focus on a niche and are therefore interesting. Apart from spin-offs contributing to the dynamism of our region, can they potentially grow to considerable sizes. Since I don’t see ICT companies moving from one place to another that quickly, we should **foster them** and see what the future holds.” (ICOOP55).*

## 5.2 Product Software Companies

Software companies have first-hand experience when it comes to collaborating with other (non-IT) organizations, governments and research and educational institutions. As such, studying individual software companies with regard to the aforementioned domains of experience provides a bottom-up perspective to gain deeper insight into how regional software industries function on a day-to-day basis. Since software companies are inherently different based on the nature of their products and services offered, employees of software companies of different sizes and product types were interviewed. The participating software companies are located in either one of the three regions as shown in Figure 5.

The interview protocol in Appendix E served as a guide during the interviews. The first set of questions are directed at the organizational aspects of the organizations themselves. This includes general information such as the year of establishment, the amount of employees, the type of software products or services delivered and the role of the interviewees. Afterwards, regional aspects such as the status of their regional software industry and perceived benefits to collaborate within the region were discussed, followed by specific attention devoted to the role governments and research and educational institutions fulfill within the region.

### 5.2.1 DynamicsComp – Veluwe / Utrecht Region (Food Valley)

DynamicsComp was **founded in 1989** and offered implementation services for ERP software produced by Baan Company. Baan Company, however, collapsed at the end of the 90’s, forcing DynamicsComp to switch to another ERP provider. The latter resulted in a choice for Microsoft Dynamics AX that to date is still offered to customers. DynamicsComp is located in the municipality of **Veenendaal** that is part of the region informally called the Food Valley, is market leader in the Netherlands and is ranked in the top 3 worldwide of companies that implement Microsoft Dynamics AX. DynamicsComp has approximately 300 people employed all around the world and has offices in The Netherlands (HQ), Germany, the United Kingdom, and the United States. Approximately **130**

**employees** are working for DynamicsComp in the Netherlands, implying that the other 170 employees work are active in international markets. DynamicsComp is best described as **value added reseller** (VAR) by tailoring the Microsoft Dynamics AX product to the demands of the customer. DynamicsComp also offers support and administration of these products to clients. The **product software** offered by DynamicsComp consists of standardized extensions made for a wide variety of industry types. In addition, **tailor-made software** is also delivered to tailor the product to the demands of the customer. The role of the interviewee within DynamicsComp is **director of customer relationship management and partnering**.

**Table 5: General statistics about DynamicsComp**

|                         |                             |
|-------------------------|-----------------------------|
| <i>Name</i>             | <b>DynamicsComp</b>         |
| <i>HQ Location</i>      | Veenendaal                  |
| <i>Employees</i>        | 300                         |
| <i>Year of Est.</i>     | 1989                        |
| <i>Interviewee role</i> | Director Account Management |

### 5.2.1.1 Regional Collaboration

When first asked whether the ICT industry in the Food Valley is prospering, stagnating or declining, the interviewee was convinced that the **regional software industry shows healthy growth rates**. The interviewee primarily attributes this to the tight network of former Baan employees still active within the region. *“Many former Baan employees have started their own company, or were spin-offs back in the day. These companies do some really good business and this is reflected in the growth of our regional software industry.”* (ICOMP1). **Cultural familiarity** is also seen as a major factor of influence that contributes to the success of the region. *“Most of the large software companies are located to the West of the Netherlands. However, primarily back in the days, many religious people with a reformed background were attracted to Baan. And of course, there were also those who were attracted by the significant successes made by Baan. This group of people settled within this region, resulting in our own tight ICT community with skilled and motivated people.”* (ICOMP2).

The interviewee argued that **regional collaboration** within the Food Valley primarily occurs on a trivial basis. *“An example of regional partnering would be DynamicsComp hiring people from within the region to fill up a temporary lack of capacity. Sometimes we see a surge in projects. We then need to be able to keep up with the demand, for which temporary workers are excellently suited.”* (ICOMP3). Next to filling up a temporary lack of capacity, did the interviewee also argue that *“sometimes we also lack domain-specific knowledge to optimally serve a customer. We then look for people who possess the knowledge we need, but these search processes and the areas in which we look are not restricted to our region. We do not care where people come from – as long as they deliver to us the knowledge we need.”* (ICOMP4). Geographical proximity was therefore considered to be an irrelevant factor.

The interviewee indicated that DynamicsComp does **not see any direct benefits of partnering up with companies located within the region**. For instance, no joint R&D investments are made, nor does an exchange of employees take place. *“I can imagine that regional partnering could be of interest to companies that deliver highly-specialized and domain-specific tailor-made software. Of course, we tailor Microsoft Dynamics AX to the demands of our customers in different types of industry. But we do not share any of this knowledge with other software companies. Why would we? In general, I think collaboration among product software companies is rather limited. Put simply, if there are no mutual benefits, we do not cooperate. And such benefits are often very difficult to spot.”* (ICOMP5). When regional collaboration does occur, however, for instance with companies run by ex-Baan employees, the interviewee indicated that normally **no obstacles surface** when working together. The little amount of regional collaboration thus lies in the **lack of perceived benefits**, rather than difficulties experienced while managing partnering relations.

### 5.2.1.2 Regional Government

The interviewee has the feeling that the **regional government cares little about the presence of the regional ICT industry**. *“I have been working in this industry for about 23 years now and guess what. I have never ever seen someone from the government nor heard of them.”* (ICOMP6). **No formal relationships** are maintained between DynamicsComp and the government, nor via other channels such as CoopFoodValley (of which DynamicsComp is not a member). The interviewee does not find it surprising that **the government pays little attention** to the regional ICT industry. *“I think you really have to take into account that there are no people working for the government who have **any knowledge about our industry**. I believe this hampers the relationship between the government and our industry.”* (ICOMP7). When asked whether an intermediary organization that could function as a spill between the regional government and the ICT industry, the interviewee indicated to not see the benefits. *“It will only generate more overhead. Besides, software companies tend to be very specialized in terms of what they do. You cannot be a representative on behalf of the entire regional ICT industry – the situation of every organization is different. This is another complicating factor when communicating with the regional government: the **diversity of our industry**.”* (ICOMP8).

DynamicsComp maintains a neutral stance when it comes to **governmental involvement**. *“We do not see any benefits in governmental involvement. Nor do we experience troubles with the regional government.”* (ICOMP9). The interviewee argued that governmental involvement could fulfill a role to spark the regional ICT sector. *“Governmental support for **start-ups and spin-offs** would be most welcome. They are usually in need of some assistance when it comes to marketing and financial support. For large and established companies such as DynamicsComp that maintain a healthy financial balance, however, I do not see the benefits of governmental involvement.”* (ICOMP10). When asked what the regional government could do to improve its current role to support the regional ICT industry, the interviewee argued that *“... since we do not maintain any relationships with the government, I do not see how the situation could improve. My advice would be to **not bother us** when conducting our day-to-day activities.”* (ICOMP11).

### 5.2.1.3 Regional Research & Educational Institutions

DynamicsComp maintains **formal ties** with the Christelijke Hogeschool Ede to **attract graduates** that usually begin their career at DynamicsComp as junior consultants. This is done to guarantee a healthy inflow of a younger generation to keep the company dynamic and bring in new knowledge. *“Developments in the ICT industry occur in a rapid manner. People who already work for our company for approximately 15 years or more tend to have a specific mindset towards our customers. We notice that fresh graduates have more appropriate knowledge of recent developments such as social media, apps, and so forth. It is crucial for an organization to stay up to date. In addition, you also have to maintain a healthy salary structure within your organization. We therefore introduced a pyramid model where graduates start at the lowest level, and are then able to climb their way up to the top.”* (ICOMP12).

The interviewee indicated that DynamicsComp is *“interested in taking part in joint initiatives between research and educational institutions [...] We really do see some benefits there.”* (ICOMP13). Examples given were organizing and taking part in seminars (that already occurs), but also other initiatives such as inviting guest speakers and taking part in joint R&D projects. The interviewee was particularly enthusiastic about one initiative: **sharing results from research conducted** by universities. To return the favor, the interviewee indicated that DynamicsComp would be glad and willing to participate more frequently in research projects if mutual benefits can be seen.

Partnering with regional research and educational institutions primarily occurs on an **ad-hoc** basis. *“We maintain a proactive attitude when it comes to providing internships and attracting graduates. For any other forms of partnering with regional research and educational institutions, I would argue that we have a rather reactive attitude.”* (ICOMP14). However, the interviewee indicated that DynamicsComp is greatly **interested in exploring the possibilities of formalizing ties** with (in particular) research institutions. *“Next to graduates and internships, we are also very much interested in taking part in mutually beneficial research projects.”* (ICOMP15). However, two factors hamper DynamicsComp from pursuing formal ties with research institutions. *“First, we have no clue what kind of research is done by universities and higher educational institutions. Second, we would have to appoint one of our employees to proactively manage such relationships.”* (ICOMP16). When asked on how the current situation could be improved with regard to the ties between research and educational institutions and the regional ICT industry, the interviewee argued that *“... an intermediary would be a great solution. [...] In addition, perhaps organizing networking events between universities and the regional ICT industry would be a nice idea. This way, both parties can get to know each other and familiarize themselves with activities conducted in both the research domain and the business domain.”* (ICOMP17).

## 5.2.2 InsuComp – Utrecht Region

InsuComp delivers an **online framework** for insurance companies to handle claims. The company was **founded in 2000** in the municipality of **Utrecht** and currently employs over **115 people**. The majority of the development effort taking place at InsuComp is classified as **tailor-made software** due to the

differing domains in which customers are active. However, a number of standard patterns form the base of the generic administrative applications offered. The latter is considered **product software**, which this research project is particularly interested in. InsuComp is managed by its four founders who also play an active role in a wide array of customers project. The organization is characterized by a flat, project-based structure. The **interviewee is one of the founding members** and is among others responsible for partner management.

**Tabel 6: General statistics about InsuComp**

|                         |  |
|-------------------------|--|
| <i>Name</i>             | <b>InsuComp</b>                          |
| <i>HQ Location</i>      | Utrecht                                  |
| <i>Employees</i>        | 115                                      |
| <i>Year of Est.</i>     | 2000                                     |
| <i>Interviewee role</i> | Co-founder & Director Account Management |

### 5.2.2.1 Regional Collaboration

InsuComp does **not collaborate** with other software companies within the region. The interviewee argued that the **perceived benefits of regional collaboration are judged to be little**. For this reason, the interviewee indicated that InsuComp is not actively seeking to expand its regional collaboration activities. *“Most companies tend to be different than us. Sometimes you are able to exchange knowledge, but that tends to be some general information.” (ICOMP18)*. When asked for clarification on why InsuComp sees little merit in regional collaboration, the interviewee argued that the markets to which InsuComp delivers its products and services are highly specialized. *“The insurance business is quite different from other domains. We notice many other software vendors within this region offer either rather simple software products sold in great quantities, or offer products and services related to customer management and marketing activities. We on the other hand deliver a complex business-to-business product to a really small amount of customers. The difference between our company and other companies is just too great.” (ICOMP19)*. The interviewee also signals a **mismatch between companies seeking to collaborate** with InsuComp. *“Most companies knocking on our door tend to be very opportunistic. They would for instance like to aid us in selling our products (rather than exchanging knowledge, red.). In that way, they are much like vultures. We do not seek to collaborate with such companies.” (ICOMP20)*.

The interviewee indicated to have **no insight into the regional software industry**. *“I have no idea on how our industry is doing. Now and then I read that the Netherlands maintains a healthy position in the global software market when it comes to product software. I notice some success stories here and there, but apart from that I have no clue. I guess we are doing fine.” (ICOMP21)*. When asked what makes the **Utrecht region an attractive location** for software companies to be located, the interviewee argued that this is most likely due to *“... our central position within the Netherlands. This is one of the reasons why we made the decision to start our company in Utrecht: our customers can easily reach us regardless what part of the country they come from. [...] In addition, the amount of*

*companies already located here will also attract other companies. It is always nice to be in the vicinity of other software companies (due to potential networking effects, red.).” (ICOMP22).*

### 5.2.2.2 Regional Government

InsuComp does **not maintain any formal or informal ties with the regional government**. When asked whether the regional government is aware of the presence and prominence of the ICT industry within the Utrecht region, the interviewee argued that “... **the regional government is not aware at all of our presence**. [...] *I think they have no idea of what we are doing. [...] They do not seem to inform themselves of the status of our industry.*” (ICOMP23). However, the interviewee argued that the **government is not solely to blame** for this lack of interest. “*However, I believe our industry does not communicate the status of our industry to the regional government either. When we deal with the regional government, it usually involves some people wanting to check whether our building complies with all the fire safety legislation out there, or how we deal with our garbage.*” (ICOMP24).

When asked on what kind of role the regional government could fulfill the regional software industry, the interviewee argued that “**opportunities are in my opinion limited**. *They should try to ensure that enough young people are encouraged to study something related to informatics and find a job in our region and industry.*” (ICOMP25). The interviewee continued by stating that “... (software companies, red.) **should not expect miracles** to occur through governmental involvement. *The regional government should orient itself at **facilitating elementary matters** such as proper education and legislation. I just do not see why a government that has little knowledge about our industry, would come up with innovation projects to stimulate our industry. The same goes for interconnecting software companies. Just leave it to us. [...] Besides, we have never ever been asked on what kind of role we see fit for the regional government to support our regional software industry. We would then first have to gauge the opinion of the software industry.*” (ICOMP26). With regard to the latter, the interviewee sees great potential in organizing such a survey. “*I have no clue on what the government could do to support our business. But perhaps if we **gauge the opinion of our industry by means of a survey**, some interesting results might show up (to which we can act accordingly, red.).*” (ICOMP27).

### 5.2.2.3 Regional Research & Educational Institutions

**Regional research and educational institutions play a prominent role** for InsuComp. “*Almost all of our new employees come from Utrecht University and higher educational institutions located in this region. Maintaining warm ties with these institutions is therefore important to our company. We primarily manage this through **study associations** and to a little extent through **academic personnel**.*” (ICOMP28). When it comes to directly approaching students, InsuComp makes use of the opportunity to give **guest lectures** at universities. In addition, **recruiters** are often present at networking events where students may get into contact with potential employers. “*I think such initiatives are great for both students and companies. Students get to have a taste of what companies they could work for, whereas companies are able to get access to potentially interesting students.*” (ICOMP29).

Despite the prominence of research and educational institutions to InsuComp, it is perceived **“difficult to get in contact with universities**. *I can understand this though, since I assume InsuComp is not the only company who would love to get in touch with students. I also understand the burden this places on the shoulders of universities: what companies would and wouldn’t they allow in?”* (ICOMP30). Concerning direct collaboration in terms of research projects, does InsuComp **not collaborate much** with Utrecht University and other universities. *“We primarily perform our own research. Either via our own employees or through internships.”* (ICOMP31). Despite this low level of partnering, the interviewee did indicate to be **willing to increase collaboration** on various terrains. *“We know complementary knowledge is present at for instance Utrecht University. Learning more about how to effectively develop and manage product software would be most welcome. But for that to occur, you really need to maintain an active relationship that is paired with increased effort. I got sent a stack of papers once. But really, this just does not work out well. You really have to meet up and talk about something in order for effective knowledge exchange to take place.”* (ICOMP32).

### 5.2.3 ErpComp – Delft Region

ErpComp is one of the largest Dutch software firms with **over 5,300 employees** worldwide. The company was **founded in 1998** by Gerard Sanderink, who remains to be the sole proprietor of the firm. ErpComp offers an extensive portfolio of **product software, tailor-made software, technical infrastructures** and **consultancy services**. Among the markets in which ErpComp is active are the public sector, housing and healthcare, supply chain management, construction, banking and insurance. ErpComp has offices in the Netherlands, Belgium, Romania, the United Kingdom, Sweden, Germany, Norway and Switzerland. The headquarters of ErpComp is located in **Gouda**, the Netherlands. The role of the interviewee is best described as **‘innovation manager’** and is responsible for the research (and related partnering) activities conducted by ErpComp in the Netherlands.

**Tabel 7: General statistics about ErpComp**

|                         |                               |
|-------------------------|-------------------------------|
| <i>Name</i>             | <b>ErpComp</b>                |
| <i>HQ Location</i>      | Gouda                         |
| <i>Employees</i>        | 5,300                         |
| <i>Year of Est.</i>     | 1998                          |
| <i>Interviewee role</i> | Manager Research & Innovation |

#### 5.2.3.1 Regional Collaboration

ErpComp does **not pay much attention to regional collaboration** with software companies located nearby. *“We are one of the largest companies within this region. If there are any potential mutual benefits stemming from regional collaboration, **firms will approach us and not the other way around**. This is one of the advantages you have as a large player. [...] In addition, **we also have a history of doing everything ourselves**. I notice this trend is changing, however. But specifically*

placing more emphasis on regional partnering? We honestly **do not care where partners come from and therefore do not devote extra time on scanning for regional opportunities.**" (ICOMP33). The interviewee indicated that **little to no collaboration occurs** on a formal basis between ErpComp and other regional software companies. "I can think of one organization that delivers to us their planning software that we integrate within our own software. I am not entirely sure whether there are more of such examples. However, again I have to say that I assume that such partners have not been specifically chosen because of being located within our vicinity." (ICOMP34). In summary, the interviewee argued that **geographical proximity is near irrelevant** to ErpComp when choosing with whom to partner, which is particularly attributed to the size and influence of ErpComp in the Dutch software industry.

When asked whether there is a positive relationship between geographical proximity and innovativeness, the interviewee argued that the absence of logistical processes and physical supply chains in the software industry contribute to the **decay of geographical proximity** being an important source for innovation. "Software is intangible. We can transfer our software to a partner within mere seconds, theoretically speaking. If we would have produced cars, for instance, the situation would have been different. [...] I think we then would have been located closer to key suppliers or customers. [...] Since we do not have any costs associated with such logistics (in the software industry, red.), I believe regional proximity matters little to none." (ICOMP35).

### 5.2.3.2 Regional Government

ErpComp does **not maintain a formal partnership relation with the regional government.** "We have contact with the regional government with it comes to tax constructions, permits, licenses, and so forth. But apart from that, I believe we do not maintain any formal relationships with the regional government." (ICOMP36). Despite the lack of a formal partnership, does the interviewee argue that the municipality of **Gouda acknowledges the presence of the ICT industry** within the region. "Gouda is aware of our industry in a broad sense. But I am **unsure to what extent this knowledge leads to any activities** or whatsoever." (ICOMP38). The interviewee was unsure whether the regional government has a proactive or reactive approach when it comes to interacting with the regional ICT industry. "I am not sure about this, but from what I can tell they tend to be **rather reactive.** [...] We do have a supplier relationship with (the municipality of, red.) Gouda. This means that you sit around the table every once in a while. But such a municipality and its aldermen, that is a **hugely fragmented** mess. As such, you do not always have the right person on the telephone when you want to get something done." (ICOMP38). When asked on how this ad-hoc communication style could be formalized, the interviewee mentioned that "an account manager could resolve this issue, to have a dedicated person to whom we can reach out when required. [...] But again, I am not sure whether we have a direct contact line with the regional government. I think we do not". (ICOMP39).

The interviewee argued that a **potential role for the regional government to support the regional software industry is limited.** "The municipality of Gouda uses our software with all the associated benefits for us. But I would not call this governmental involvement – they simply cannot purchase the software of every organization here within the region. [...] What would be nice though, is if we would

be **updated in advance of the roadmap** Gouda has when it comes to what they are planning to do within the region. We already hold such talks, but this is more or less to make sure that Gouda, for instance, will not decide to locate a brothel next to our building. Because if that would be the case, then we would be immediately gone here. But again, I would not call this direct involvement in our industry either.” (ICOMP40). When asked what the interviewee would do if he would swap roles with a governmental representative to support the software industry, the interviewee indicated to “not have a clue. I do not immediately see any things I would do to support the software industry. I think the options are really limited. [...] ErpComp makes use of the WBSO (Wet Bevordering Speur- en Ontwikkelingswerk) to acquire R&D tax credits. But we receive such subsidies from our national government – the regional government or Gouda has nothing to do with this.” (ICOMP41). In summary, the interviewee argued that he **perceived the role of regional and local governments to be limited** concerning governmental support for the software industry.

When asked whether the software industry is treated in an equal way with other types of industries when it comes to economic policies and governmental interest, the interviewee argued that **the software industry is often neglected**. “The software business is a difficult topic to discuss. For instance, the software industry demands **long-term investments**, it takes quite a **long time before you are able to see direct results**, it is paired with **long-term usage** (due to significant investments, red.), and it is intangible and expensive. You know, when compared with the technical infrastructure that can be replaced every three years or so, does software experience **great resistance to change** (due to the affinity of users to the software, red.). We as an industry are not able to change this overnight. I am not sure why the situation is how it is.” (ICOMP42).

### 5.2.3.3 Regional Research & Educational Institutions

ErpComp maintains formal ties with several regional research and educational institutions. “We look at the Rotterdam University of Applied Sciences, The Hague University of Applied Sciences and Utrecht University. Most of the business we do with regional research and educational institutions occurs with these three parties. We have many contacts at these institutions.” (ICOMP43). When asked how ErpComp manages and maintains its relationships with research and educational institutions, the interviewee argued that “In general, as a company, **you have to invest significant amounts into such relationships**. However, it is sadly the case that this does not happen vice versa. **Too little attention is paid to our industry by universities**. [...] ErpComp is able to deliver **continuity** when it comes to ideas, wishes and people. But when we look at the contacts we have at Universities of Applied Sciences, we always get to speak with another person (we do not know, red.). As a consequence, there is a **lack of common ground and trust**. The historical element of the relationship we have with such institutions is absent. [...] Despite we invest in these institutions, it has never really given us an advantage such as a preferred supplier status. I do not expect to receive such benefits per se, but our **efforts are not recognized**. We find this difficult to understand.” (ICOMP44). When asked for clarification, the interviewee stated that “It is my opinion that universities often place themselves upon a pedestal. There is **no trace of complaisance** of universities. I find this a real pity.” (ICOMP45). In addition, the interviewee argued that “ErpComp and other software companies experience the problem that **graduates often lack the skills required to do a job well**. For instance, too many

*business informatics students are not able to code a single word and only want to focus on process analysis. As you may understand, this will not work out.” (ICOMP46).*

To bridge the gap between the skillset of graduates and the needs of software companies, ErpComp “would therefore **appreciate to have speaking volume in the curricula offered by universities.**” (ICOMP47). The interviewee argued that ErpComp is very much **willing to engage in talks** with universities about their curricula on a regular basis. In addition, the interviewee was also excited to get involved in the creation of new courses taught at universities. “**We would be really interested to closely work together with other companies and universities to bring forth new courses.** [...] We are able to deliver part of the expertise required. [...] We could even arrange a range of guest lecturers that match the contents and learning outcomes of such new courses. [...] I think this is a great idea, and I am sure other companies will think the same about this.” (ICOMP48).

When asked what the interviewee would do different if he would be a partner manager at a university, the interviewee emphasized that “**continuity is of utmost importance in a relationship.** Sure, we are usually able to get in contact with someone at a university who is responsible for partner management. However, it is our experience that these people switch jobs at a rapid pace. [...] From our side, we aim to deliver this continuity. Sadly this does not occur the other way around. Every single time we have to communicate who we are, what we do, what we have achieved, and what we would like to achieve in the future. After six years, I wonder: do they still have no clue?” [...] If Utrecht University for instance would pay more attention to us, we are very much willing to return the favor. [...] It is also very **difficult to plan ahead in time.** For instance, ErpComp was tremendously enthusiastic about the software product management course taught at Utrecht University. But what happened? The lecturer left for another university and the course is scrapped from the curriculum and the knowledge is gone. We experience this as a real handicap. [...] Again, all of this could be resolved by continuity (so we know what is going on and what will happen in the future, red.)” (ICOMP49). When asked how this continuity could be offered by universities, the interviewee mentioned “**more frequent contact with universities and that the same responsible people should be involved.** [...] To make this process more efficient, **scaling up such contacts with other companies could be an idea.** [...] Again, we do not have to see immediate results. But at least provide continuity that would solve most of the problems we experience.” (ICOMP50).

#### 5.2.4 InnovComp – Utrecht Region

InnovComp, **founded in 1993**, is specialized in software development, application management, outsourcing, and the migration of legacy software. The company develops solutions for product software vendors based on market demand, the latest innovations and technologies. As such, **InnovComp does not offer product software itself.** The core competence of InnovComp is to help software companies in applying business driven product development, and to translate market demand to software products. InnovComp has over 200 employees, of which approximately **10 FTE is working in the Netherlands** at InnovComp’s Headquarter in **Utrecht**. The other share of employees are located either in Cluj-Napoca (Romania) or Iasi (Romania) where the actual software development takes place through outsourcing.

InnovComp is part of Total Specific Solutions (TSS), Europe’s largest Vertical Market Software company. TSS is characterized by a decentralized structure and consists of seven companies. Although every company enjoys a great amount of freedom, a general strategy is defined by the overarching board of directors. The interviewee serves as **managing director** of InnovComp since January 2011, and is Chief Human Resources at the parent organization TSS. In addition, the interviewee has a background in the services industry and outsourcing and previously served as Consulting Director at SAP Nederland.

**Table 8: General statistics about InnovComp**

|                         |                   |
|-------------------------|-------------------|
| <i>Name</i>             | <b>InnovComp</b>  |
| <i>HQ Location</i>      | Utrecht           |
| <i>Employees</i>        | 200               |
| <i>Year of Est.</i>     | 1993              |
| <i>Interviewee role</i> | Managing Director |

#### 5.2.4.1 Regional Collaboration

InnovComp is **not active within the region of Utrecht** and **sees little merit to collaborate on a regional scale level**. “We do not partner at all with other companies within the region. Not even with Utrecht University. [...] Neither are we a member of a cooperative network (such as CoopUtrecht, red.)” (ICOMP51). When asked about the status of the Dutch product software industry, the interviewee believed that “the Dutch product software industry is an enormous industry. I think it is **enormously underestimated**. It should also **seek to professionalize itself**. There are a lot of product software companies out there who are trying to reinvent the wheel themselves, and I see them (unnecessarily, red.) **suffer greatly in doing so**.” (ICOMP52). About the status of the product software industry within the region of Utrecht, the interviewee argued that it is hard to tell whether the industry flourishes, stagnates or is in decline. “I find **the Utrecht region a services epicenter**. Perhaps that says enough. I do not see it flourish. You will notice that it is the services industry that is currently facing tremendous pressure. **The product software industry has a challenge that can be tackled** (challenges related to e.g. changing business and delivery models, red.), **but the services industry** (that generally follows in the footsteps of the product software industry, red.) **has to reinvent itself**. And when I look around me, I primarily see companies that offer services. [...] And these are the companies whose business models and value adding activities are being debated. Honestly, I find it difficult to make an adequate judgment.” (ICOMP53).

When discussing whether geographical proximity is still a factor that matters, the interviewee argued that although the importance of spatial closeness is waning, **geographical proximity should not be neglected**. “Most product software vendors once started out as tailor-made software producers. However, as more and more customer projects are being carried out and processes get automated, a shift toward productization can often be witnessed. As such I find it quite reasonable that software vendors are located within the vicinity of their clients.” (ICOMP54). Despite product software vendors

being, according to the interviewee, often tied to the region from whence their first customers came, did the interviewee also argue that *“I think that **collaboration is not geographically bounded in any way.** [...] I do know that one of our sister companies named TAS that produces embedded software, really thinks in terms of regions. They are for instance located in the region Eindhoven, a location deliberately chosen to be within the vicinity of their customers such as ASML and Philips. This has nothing to do with the proximity of universities or any other companies or institutions.”* (ICOMP55). In summary, the interviewee argued that companies often have their headquarters at a location from where they first started their business and had their first customers, rather than deliberately picking a specific location to start their company.

Despite the apparently limited influence of geographical proximity between actors within regions, did the interviewee emphasize the **importance of fostering start-ups within regions.** *“There is also another perspective that I have, being start-ups coming forth from universities. Some of these start-ups will become successful and **will remain located within the region where they were initially founded.** I think Delft is successful with this, that has attracted many start-ups that eventually became rather large companies. I do not see such things occur in Utrecht. Perhaps I fail to see it, or if that it is just not present. [...] But again, if you see what beautiful and mature businesses can arise from start-ups, **I think it would be greatly beneficial to regional economies to keep them within the region.**”* (ICOMP56).

When asked **what would make the Utrecht region successful** compared with other regions, the interviewee indicated that this is primarily due to *“our **central position** within the Netherlands. We are here because every traffic jam leads to Utrecht. That is the advantage of our region.”* (ICOMP57). The interviewee also argued that companies do not regard the proximity of universities as factors of influence when picking a destination on where to e.g. build a new office. *“I think this is not important in the Netherlands. [...] Look, our sister company Pink Roccade has the greatest share of their team working in Apeldoorn and another company is located near Den Bosch. They don’t take universities into account. And why would they? [...] The Netherlands rather small anyway, and I assume **graduates do not care to spend some more time traveling if they can find the job of their dreams in any random city** (where that employer would be located, red.).”* (ICOMP58).

#### 5.2.4.2 Regional Government

The interviewee indicated to InnovComp has **nothing to do with any form of government**, nor do all other companies operating under the umbrella of TSS. When asked what kind of role the government could play to support the software industry, the interviewee replied that *“There are people who say that it is strange that the software industry is not marked as a top sector (referring to the Topsectorenbeleid, red.).”* [...] *I think that **the software industry does not yet deserve such a status.** Because honestly, **although our industry is fairly large compared with other industries, we do not generate any mindboggling export figures.** [...] **It would be a more interesting sector if the export numbers would show an increase.** Because right now, export-wise we do not do that much.”* (ICOMP59). The interviewee indicated that the amount of **software products developed for vertical markets, rather than horizontal markets, may hamper this growth.** *“The Dutch product software*

*industry produces quite a lot of software aimed at vertical markets – we excel in this. But vertical markets often come with their own specific laws and regulations that are specific for the Dutch market. Some software companies therefore solely have the Netherlands as their market.” (ICOMP60). When asked for an example, the interviewee mentioned that “the hospital ICT industry (in the Netherlands, red.) is substantially different from other countries in the world. It is obvious that this makes it difficult to export such products tailored to our own legislation. [...] On the other hand, everything is organized in a rather good way in the Netherlands. Other countries are still busy formulating legislation for which the Netherlands serves as one of the model countries. [...] I think this is a brilliant export proposition (to deliver a total solution, red.). [...] I think **the government could do a lot more to stimulate these processes** (and attract attention from other countries, red.)” (ICOMP61). However, it has to be taken into account that such negotiation processes are often done by the national government, rather than regional and local governments.*

The interviewee recognized that the **shortage of capacity is hampering the growth of the product software industry** in the Netherlands. *“The big problem in our market [...] is the mediocre flow of students graduating from universities. The **lack of focus within curricula** is also a problem. When I go to Romania, I can find many students who know everything about software architecture. But here in the Netherlands? [...] Perhaps **the government could aid our industry in steering this in the right direction** (for instance by means of media campaigns to attract more students specialized in ICT students, red.)” (ICOMP62).*

When asked what the interviewee would do when he would serve as a governmental representative toward the software industry for one day, the interviewee argued that *“I believe that **the government is not there to solve the problems of our industry**. [...] I think **our industry and the Netherlands as whole lacks a long-term vision**. We should ask ourselves: what is the our right to exist? Then we should find out to what extent ICT is able to contribute to our right of existence, then translate this to the needs coming from our industry, and then look for solutions to counter these problems. We have lots of **legacy and immaturity within our industry**. The **lack of graduates** is not the only problem, but also the **inflexibility in our labor market** and the **mediocre innovation climate** within our country. These three are related to each other. This is **partly caused by the government**, so we will have to look for a solution to solve this.” (ICOMP63). No immediate solutions, however, could be given by the interviewee.*

#### 5.2.4.3 Regional Research & Educational Institutions

The interviewee argued that **research and educational institutions are “obviously important**. *But I think that if Sjaak Brinkkemper would have been located in Eindhoven instead of Utrecht, this would have made no difference to me and I would still have reached out to him. [...] The **location of such institutions is therefore irrelevant** to me.” (ICOMP64). When asked what the purposes are of partnering with research and educational institutions, the interviewee indicated that *“InnovComp is primarily **interested in research**. But from a TSS perspective, we are **in need of graduates**.” (ICOMP65).**

When asked what could improve the synergy between the ICT industry and research and educational institutions, the interviewee argued that *“I think that universities should be both better informed and inform themselves on the needs of our industry. I also think that our industry should take more responsibility in doing so. [...] I think the greatest shortage our industry is currently dealing with, is the lack of well-educated software engineering graduates. However, we are also in great need of business engineers who can think from both a functional and a business perspective. With this I mean product managers. [...] This is not just my personal experience at InnovComp. I truly see this all around me in the entire ICT industry. [...] Universities should therefore not skew their policy to either of these sides (since more emphasis on software engineering will lead to a decrease in the amount of business engineers, and vice versa, red.). [...] In summary, the bottleneck in our industry is a strong lack of graduates who are able to translate business needs from customers into technical solutions offered by software companies.” (ICOMP66).*

When asked what the interviewee would do different if he would be a professor at a random university for several months, the interviewee recognized that **continuity in the relationship** between research and educational institutions and the ICT industry is of utmost importance. *“I think Nyenrode is a perfect example of good collaboration between industrial sectors and a university. [...] They do two things. First, they connect the industry with their university. The industry is able to exert strong influence over the direction in which the research and education should be done. [...] Second, as a company it is fun and great to see results. This makes it also more enticing to companies to invest more in such a relationship. A relationship should be mutually beneficial and you therefore have to be open for each other’s goals. I would say to every university: have a roundtable discussion with influential companies, ask what are your goals for the coming five years, then present your own goals for the coming five years, and then ask how can we relate these goals to each other.” (ICOMP67).*

### 5.2.5 FinComp – Delft Region

FinComp is an internationally operating software company with a particular focus on small and medium businesses. The company serves customers in a wide array of markets, with a focus on the manufacturing, retail, finance and construction industry. It was **founded in 1984** by five Delft students with a background in engineering and has expanded to over 20 different countries with **approximately 1900 employees** in total. The headquarters of FinComp is still located in **Delft**, the same municipality where it was founded. The majority of the software offered by FinComp is **product software** and is offered to customers by means of various delivery models, ranging from on-premises installations to cloud and SaaS subscriptions. The interviewee serves as the **product marketing director** for FinComp in the Netherlands.

**Table 9: General statistics about FinComp**

|                    |                |
|--------------------|----------------|
| <i>Name</i>        | <b>FinComp</b> |
| <i>HQ Location</i> | Delft          |
| <i>Employees</i>   | 1,900          |

|                  |                 |
|------------------|-----------------|
| Year of Est.     | 1984            |
| Interviewee role | Partner Manager |

### 5.2.5.1 Regional Collaboration

FinComp has numerous software reselling partners, of which approximately 80 are located in the Netherlands. According to the interviewee, *“Each partner usually has its own region or rayon it services. Partners tend to be regionally bounded due to their customers located within their regions. [...] As such, you could say that the regional dimension is more or less important to our organization. [...] They (partners, red.) also often deliver hardware, infrastructure services and consultancy. An additional category are value added resellers, that produce tailor-made software upon the platform delivered by FinComp. Apart from this, there are no other forms of partnerships directly targeted at FinComp such as employee exchange or testing.”* (ICOMP68). The interviewee indicated that niche creators that extend and refine the platform are not intentionally located close to FinComp: their location is entirely arbitrary. The interviewee agreed that the latter is characteristic for the software industry, being that *“the intangible nature of software makes geographical proximity almost irrelevant contrary to manufacturing industries. [...] Now and then a partnership happens to occur between two companies located within the same region. [...] But we do not have such partnerships that are initiated from our side. [...] We really do not care where other companies are located, as long as we see the benefits of partnering with them.”* (ICOMP69). In addition, the interviewee also mentioned that little value is perceived of maintaining an extensive relationship with cooperative networks located within the region (e.g. CoopDelft).

According to the interviewee, **incubators** can be an *“interesting place to acquire and exchange interesting knowledge and to get some insights in interesting developments taking place. [...] But this (having contact with the incubator, red.) occurs on an ad-hoc basis. We do not really maintain any formal ties, but you see that incubators flourishes. [...] You can really see the incubator contributing to the economic dynamism of this region. And such things are really nice developments taking place within the region.”* (ICOMP70).

When asked why **FinComp maintains no formal relationships with other companies within the region**, the interviewee argued that *“this is considered natural because FinComp is a large company and we are therefore not in direct need of partners located within our direct vicinity. [...] And the reason behind the ad-hoc nature of our relationships is that when we maintain formal relationships with other companies, such relationships tend to become really formal, literally speaking. We then quickly search for global partners who could help us out in a quick manner on a global scale. When a relatively small company knocks on our door to test our software, this is just less relevant to us. [...] You see, we have an immense customer base. We therefore look for additions to our software products that are able to impact our entire customer base. Little players within the region are often not able to provide this, hence our global perspective. [...] Also, when we acquire a component from a local player that is only available in Dutch, our Australian colleagues will immediately ask for an*

English version since they want to offer it to their customer as well. You can see the problem that arises here.” (ICOMP71).

When asked what makes the region Delft successful, the interviewee mentioned “*the **influx from universities**. I think FinComp could contribute more to universities, however. We faced lots of reorganizations and FinComp had an inward looking attitude. But I think companies such as FinComp and 3M can **greatly benefit from such regional relationships with universities**. The **government could also contribute to this**, whether this is done by local governments or the national government. Such things have to be stimulated.” (ICOMP72). Examples provided by the interviewee are “organizing information sessions, creating software community, and so forth. FinComp and other companies are then also willing to contribute to such initiatives.” (ICOMP73).*

### 5.2.5.2 Regional Government

The interviewee argued that **the regional ICT industry gains less attention from the government than peer industries do within the region**. “When I look at the Topsectorenbeleid, I become quite sad because they miss out on so many valuable opportunities out there. Most definitely (opportunities, red.) at companies such as UNIT4, FinComp, and other software companies within our country. [...] The funny thing is, when you at the hardware industry, the greatest share of those business are primarily located in the United States. But when you look at what Europe has to offer with enormous companies such as SAP but also companies like FinComp, UNIT4 and AFAS in the Netherlands, **we have a wide array of interesting companies with modern technologies**. But I notice **very little attention is paid** to this. I find this truly sad. [...] I know of wonderful technologies invented here in the Netherlands, but just so little attention is paid to the software companies bringing forth those new inventions. It makes me sad that American software companies copy jaw-dropping solutions invented over here and then achieve great fame and profits whereas the inventors themselves here in the Netherlands clearly fail to achieve a similar status.” (ICOMP74). The interviewee indicated that the relatively limited success of Dutch software firms could be attributed to the **lack of scale economies**, that are present in the United States. However, the interviewee also argued that “I still think the Netherlands is quite famous for its knowledge-based economy and is therefore a relatively interesting market in which software products can be launched. [...] We as an industry should most definitely try to **focus more on our expertise and profit from this**, however.” (ICOMP75).

The **government remains informed about the status of the software industry through both own initiatives, as well as from being approached** by software companies. “For instance, FinComp produces administrative software. Our software products are very much dependent on the legislation formulated by the government. As such, we often encounter them in all kinds of panels on a yearly basis.” (ICOMP76). Experiences with the national government, however, were far from positive. “We experience the **national government to be irresponsive and slow**. A realistic scenario would be the national government deciding on 27 December that a piece of legislation relevant to our software should be changed in our software product before 1 January. We would need at least 80 man-days to properly address this change. This is impossible.” (ICOMP77). When asking the interviewee whether it would be a correct observation to state that the **administrative software industry is highly**

**dependent on the government**, the interviewee argued that this dependence is “*enormous. I mean, if the government formulates an extremely complex piece of legislation and decide to implement this one week before the new year [...] we will have to adjust our software without knowing what exactly the details of the new or changed piece of legislation will be. This is has an enormous impact in our business. [...] We are often informed at a late stage of the final details of the new or revised piece of legislation. I do not call this ad-hoc behavior since the topics are known beforehand, but you will notice the government will take a decision short before the deadline. We then have very little time at our disposal to carry out the necessary changes to our software. But at the same time, the government will place significant pressure on our business to get our software fixed. Even more because we deliver software to the government – the same goes for UNIT4 and AFAS.*” (ICOMP78). However, as the interviewee indicated, all of the aforementioned issues involve the national government, contrary to regional and local governments. With respect to the latter, the interviewee mentioned that **FinComp has “very little to do with the regional government. Legislation is being passed down from the national government anyway, so this is not a problem. There is, for instance, no salary-related legislation per region. [...] As a consequence, we have little to do with them.”** (ICOMP79).

When asked what the government could do better to support to the software industry, the interviewee argued that “*We are a global player. An example would be the **government introducing us at their peers in other countries** (to market our services, red.). [...] In the Netherlands we have a relatively high penetration of product software used by all kinds of various organizations. If these successes could be evangelized to organizations in other countries and see what Dutch product software companies such as FinComp or UNIT4 have to offer, I think this would be greatly beneficial to our business.*” (ICOMP80). With regard to what regional governments could do better to support regional software industries, the interviewee argued that “***the role of regional governments supporting their own software industries is limited.** I think our industry, and in particular bigger players such as FinComp and UNIT4 benefit the most from tax benefits related to innovation expenditures. [...] I think that even **the current role of the regional government is opaque.** Ask a handful of software companies what they know about the government in their region. I think most companies will have no clue. [...] In other words, I can imagine the national government being an influential player that is able to, for instance, advocate our interests on the global stage. But the regional and local governments? **Their influence seems limited** and will primarily concern providing housing for employees, promoting our region to attract more people, and so forth.*” (ICOMP81).

### 5.2.5.3 Regional Research & Educational Institutions

When asked whether regional research and educational institutions were perceived to be important, the interviewee argued that “***we do recognize their value.** However, I think **we have paid little attention to them** over the past few years. Too little actually. [...] **We would like to pay more attention** to this, however. Examples are maintaining better ties with scientists at universities who perform research on software engineering models, software product management, and so forth. From my point of view I strongly support this and **associate clear benefits with it.** Right now, however, such **collaboration occurs on an ad-hoc and reactive basis.**” (ICOMP82). When asked for*

an explanation, the interviewee argued that **FinComp was too busy with its day-to-day operations**, primarily after having dealt with a reorganization. FinComp is **not actively looking for collaboration opportunities** with universities. The interviewee argued that **the main complicating factor is time and availability** (e.g. to supervise internship students). *“Short-term thinking rules our agendas and we therefore are not able to take part in projects that span multiple months (such as comprehensive research projects, red.)” (ICOMP83)*. The interviewee did mention, however, that a shift with regard to collaboration with universities is expected. *“FinComp recognizes the value it has, but a structural change is required.” (ICOMP84)*.

The interviewee argued that **universities could put more effort into maintaining relationships with companies**. *“I think contact on a higher level should be intensified. [...] I do not know where to start, however, since we as FinComp have no insight in what a university could offer in terms of knowledge, assistance, information, research, and ongoing projects.” (ICOMP85)*. When asked whether FinComp also collaborates with universities on a less formal basis, the interviewee indicated that *“we do partner with universities, but indeed on a lower level. An example is students who apply at FinComp for an internship. But this occurs on an individual basis without any formal structure, without any concrete plans. For instance, there are no research directions formulated that aim at exploring our sales models to create better business cases, and so forth.” (ICOMP86)*.

Although FinComp recognizes the **mismatch between the skillset of recent graduates and the needs of the company**, the interviewee argued that this is not a problem because *“We train our people in-house. For instance, we even recruit people who studied at the Hogere Hotelschool (Higher Hotel Management School). They are very customer oriented and are apt enough to understand our business. Like all of our other employees, regardless of their background, we train them in the workplace. [...] In that sense, we do not really care about the mismatch between the curricula of universities and our needs. [...] However, we do signal that there is a lack of graduates with enough fundamental knowledge on topics such as software architecture that we consider essential. But again, we are capable of training our employees while they are on the job, so I would not call this a major issue. [...] Despite all this, I do believe that it is really important to maintain a good and constructive dialogue between companies and universities. Universities should be aware of the needs of software companies, and software companies should indicate what kind of graduates are much sought after. [...] In sum, I think it is crucial for universities and companies to know what they are both up to. Issues and mismatches will always exist, but as long as affairs are properly handled on a higher level, we will all be fine.” (ICOMP87)*. The interviewee did not feel the urge to comment on anything else that was hitherto not discussed.

### 5.3 Governmental Representatives

Every municipality and province in the Netherlands is governed by official institutions and their representatives. These institutions have a plethora of responsibilities and tasks, among which are formulating conditions and executing policies to achieve an envisioned future status of their own demarcated area of influence. With regard to the influence governments have on regional software industries, governments are for instance able to define laws and enforce rules, purchase software

products or services, advocate for the interests of the product software industry, provide knowledge infrastructures (e.g. networks, events) or reduce cost of capital by offering loans. The aim of the case study interviews with governmental representatives was to assess the current role of governments supporting regional software industries and this could be improved.

The case study interviews with governmental representatives were held after the interviews with the cooperative networks and software companies were conducted. Part of the questions asked to governmental representatives are based on answers given by cooperative networks and software companies, in order to cross-validate sentiment and to see whether perceived benefits, drawbacks and issues concerning governmental involvement are mutually recognized. The interview protocol in Appendix F served as a guide during the interviews. The first set of questions are directed at the organizational aspects of the governmental institutions interviewed. This includes general information such as their demarcated area of influence, year of establishment (if applicable, e.g. in case of a regional economic board) and the official role of the interviewees. Afterwards, the perceived importance of regional software industries was gauged, including related questions such as whether the government has sufficient knowledge to create effective policies to support the software industries, or how governments remain in touch with regional software industries and vice versa. Finally, the potential role of governmental institutions was discussed, including multiple examples on how to improve the current role the government fulfills to support regional software industries.

### 5.3.1 Regional Economic Board Utrecht – Utrecht Region

The (Regional) Economic Board **Utrecht** (EBU) was **founded on 31 October 2012**. Its **primary aim is to address and tackle societal issues by bringing together representatives from different types of industries, research institutions and governments within the Utrecht region**. Although the regional economy of Utrecht prospered over the past few decades, it now faces pressing societal issues such as population aging, increasing health care expenses and having to make a shift toward sustainability. Despite the concentration of expertise possessed by companies, research and educational institutions, does the Utrecht region not succeed in effectively tackling the aforementioned challenges. Central to this problem is that potential collaboration partners from different domains have often never heard of each other, nor know what expertise is available within their region. This is considered a shame and a waste of opportunities, since solutions to societal issues can often be tackled by combining expertise from multiple domains. The EBU is convinced it can create this required awareness of companies within the Utrecht region and therefore **aims to connect stakeholders from different domains** to promote joint initiatives.

The EBU consists of **21 board members** of which each member is a president or executive of a large and influential organization within the Utrecht region. Every board member has its own domain-specific background. Making use of their different backgrounds and extensive networks of contacts, these board members together aim to stimulate economic and sustainable development projects within the Utrecht region. This occurs by means of evangelizing and connecting companies, research and educational institutions and governments. The EBU is supported by a group of public officials

that come from different governmental institutions, among which are the Taskforce Innovatie Regio Utrecht, the province of Utrecht, the municipality of Utrecht and Amersfoort, various Chambers of Commerce and various educational institutions such as Utrecht University and Utrecht University of Applied Sciences.

Two interviewees took part in this case study interview, who both belong to the [SNIP]. Although multiple interviews at the municipalities of Utrecht and Amersfoort and the province of Utrecht were requested at first, contact information of the two interviewees working for the EBU was provided instead. The civil servants working at the municipalities of Utrecht and Amersfoort and the province of Utrecht argued to [SNIP]. Instead, the interviewees were considered ideal candidates because of their position in-between companies and research and educational institutions on the one hand and governments on the other hand. The role of **the first interviewee is research coordinator** within [SNIP] of the EBU. **The second interviewee is a researcher** and also belongs to the same EBU [SNIP], but has a focus on research on how to boost cross-sectorial entrepreneurship within the province of Utrecht.

### 5.3.1.1 Regional Aspects

When asked whether the regional and local governments within the province of Utrecht are aware of the presence of their ICT industries, the interviewees indicated that **Utrecht no longer regards the ICT-industry as an individual industry**. *“Utrecht has departed from the idea that regional economic policy should be formulated based on classical economic sector analyses. [...] In short, we now regard the ICT industry as a crucial enabler for economic growth to take place, rather than an industry on its own. We therefore regard the ICT industry as a part of a much larger and interconnected network, rather than an individual industry. [...] I think it goes without saying that since we consider ICT as a core enabler of regional economic development, that we strongly believe that our ICT industries are essential and therefore deserve our full attention.”* (IGOV1). Since the municipality of Utrecht therefore regards regional ICT industries as part of a larger whole, the interviewees are not able to answer the question whether regional ICT industries deserve more or less attention from governmental policymakers than other industries. The interviewees also mentioned that their approach is similar to the one presented in the Topsectorenbeleid. *“For instance, when you look at the Topsectorenbeleid, you will notice that ICT is not listed as a separate sector. The reason behind this, is that the ICT industry is also regarded as an enabler from a national perspective. The presence of a successful ICT industry makes or breaks a national economy. We derived our regional perspective from this national perspective.”* (IGOV2).

The interviewees argued that it should not come as a surprise that civil servants working for governments have little knowledge about the software industry. *“You should not expect a civil servant to have knowledge of the software industry. A civil servant is responsible for shaping an effective framework and atmosphere in which businesses can unleash their maximum potential. They do this by recognizing and defining prerequisites (randvoorwaarden, red.) such as the attraction and retainment of talented employees within the region, providing a modern digital infrastructure, manage business areas (bedrijventerreinen, red.), and so forth.”* (IGOV3). When asked whether

knowledge about the ICT industry should not be mandatory considering the increasing emphasis on regarding the ICT industry as an enabler for other businesses to thrive, the interviewees argued that *“a shift can currently be witnessed. **Governments within our region are currently in a transitional period towards this modern take on ICT.** Right now, my answer is that **civil servants have no clue about anything related to ICT.** But this is changing rapidly and it is still work in progress. I do get your point, however, which is also why we, including those civil servants, very much welcome the research you perform with Sjaak Brinkkemper and several others.” (IGOV4).*

### 5.3.1.2 Contacts with the ICT Industry

The EBU is informed about the status of regional ICT industries through various communication channels. The first communication channel mentioned is the **regional cooperative network** CoopUtrecht. *“It (CoopUtrecht, red.) is an important ICT network and an important link to connect companies and governments. However, we do not yet have a fancy **ICT monitor** like we have for the gaming industry by means of which we can monitor economic growth. [...] But we will still have to come up with a way on how we can realize this, since we deviated from the idea that we should measure every industry on its own. [...] We are therefore way more interested in questions such as: how do you apply ICT in the most optimal way to accelerate growth in regional economies? [...] Research conducted by the University of Amsterdam on the financial ICT cluster in Amsterdam several years ago indicated that there are ample opportunities for that industry to grow, thanks to the presence and complementary needs of financial organizations within their vicinity. These companies require highly specialized financial software, therefore sparking entrepreneurship and interest in their regional ICT industry.” (IGOV5).*

The interviewees indicated that **regional economic policies are increasingly formulated in cooperation with practitioners from industries.** *“If governments formulate regional economic policies without even gauging the opinion or needs of an industry, then you will be keelhailed as soon as it gets published. [...] Right now **it is considered essential to formulate regional economic policies in cooperation** with practitioners or representatives from various types of industries. If you do not do this, you will see a regional economic policy that does not address nor match the needs of industries.” (IGOV6).* The interviewees argued that the EBU plays an important role in formulating such regional economic policies. *“Two years ago we organized various **roundtable sessions**. We organized such roundtable sessions for different types of industries, that we now organize on a routine basis, to check whether practitioners agree with what we have in mind. At the same time, their opinions steer us in a specific direction by indicating where we should direct our attention at. This is one of the most important characteristics of the EBU: **industries themselves have to indicate what is important to them, so that we are able to formulate policies that most optimally match with their needs.**” (IGOV7).* Attendance to such roundtable sessions occurs on an invitation-only basis, and are therefore not walk-in sessions. *“When we look at sectors on their own, it speaks for itself that we only invite representatives from that specific industry. However, sometimes we also organize gatherings with a specific theme. If that is the case, we invite representatives from different kinds of industries to allow for a cross-fertilization of multiple industries and to see if something interesting*

can be done. [...] We then ask various parties such as CoopUtrecht whether they know any interesting people we could invite to attend the roundtable sessions.” (IGOV8).

When asked what the regional ICT industry of Utrecht could do to reach out to governments in order to create economic policies that match with the needs of the industry, the interviewees indicated that **“ICT companies should seek to collectively organize themselves. For instance, the gaming industry is a prominent example of where it goes wrong. Company A yells something, company B yells something, and these companies have no idea what their peers are up to. They should aim to bundle their forces to have more speaking volume to more effectively communicate their short and long-term needs and issues to us.”** (IGOV9). However, the interviewees mentioned that this demands new skills from entrepreneurs. *“Entrepreneurs have always been very much focused on surviving, their own customer base, their own assets, and so forth. As companies grow, you tend to notice a gradual shift towards specialization that augments the need to collaborate and seek for complementarities among companies.”* (IGOV10). The interviewees argued that *“what is really important here, is that companies should embrace the principle of reciprocity: be able to give and take, even when your direct competitors are involved. An example is the competition for graduates. The flow of skilled graduates is often low, and companies tend to hunt on their own. However, **only together will they be able to address the deficient flow of graduates and be able to attract attention from other stakeholders** such as governments and educational institutions. But sadly, such a change in attitude has not yet occurred.”* (IGOV11).

The interviewees indicated that **communication toward and from regional and local governments does not occur on a proactive nor reactive basis.** *“If an account manager, domain manager, or whoever (public official, red.) that stays in touch with companies recognizes various signals that point in the direction of potential issues or opportunities for which we could provide assistance, he or she will double check such sentiment at other companies. A couple of other companies including trade organizations are then often asked whether they recognize the signaled problem, to ensure these problems are indeed experienced within an industry. However, companies themselves can also raise their own finger and indicate to the government with what kind of problems they are dealing with. [...] **There are therefore no one-way communication channels or a proactive or reactive attitude, but a combination depending on the situation.**”* (IGOV12).

### 5.3.1.3 Interregional Governmental Collaboration

The interviewees were **uncertain whether in-depth interregional collaboration takes place when it comes to formulating regional policies.** *“Although that is another discipline, I am able to give you an example of effective interregional collaboration. For instance, the municipality of Amersfoort already has a fiberglass network in place that is widely available. What is more, they also created a network where potential exploiters of the fiberglass network can inform themselves of the possibilities for their businesses. We here in Utrecht (the municipality, red.) would like to achieve a similar situation, so we are therefore studying our situation together (with the municipality of Amersfoort, red.) and see what we can learn from each other. I think this is major step in the right direction. [...] I also know that for the Digitale Steden Agenda (Smarter Cities Agenda) in which multiple large municipalities are*

*involved that such as Amsterdam, Rotterdam, Utrecht and The Hague, engage in intercommunal discussions to see how they can aid each other. I therefore do know that such initiatives exists, but I have no knowledge of all the details.” (IGOV13). However, despite such initiatives, the interviewees also indicated that **the success of such interregional or intercommunal collaboration “strongly depend on the attitude and vision of responsible aldermen or governors.** In (the municipality of, red.) Amersfoort, the aldermen were really progressive and wanted the ICT sector to take a leap forward to be prepared for the future. They therefore decided to place great emphasis on financing an extensive fiberglass network and related services to spark innovation, to experiment what business opportunities could arise thanks to a fiberglass network. The result is that the municipality of Amersfoort is now approximately two years ahead of Utrecht in terms of modern technology. [...] But what is important and what we appreciate very much, is that they are willing to share their experiences with us. This way mutual benefits are achieved and we all benefit from it, rather than competing between our municipalities.” (IGOV14).*

When asked whether competition or complementary between regions dominated the formulation of regional economic policies, the interviewees indicated that **“complementary regional economic policies are becoming increasingly prevalent.** It took a while, but the municipality of Utrecht now starts to realize that if we are located approximately 20 minutes from each other (other municipalities, red.), it makes figuratively speaking no sense to compete to the death. This sentiment is reinforced when you look at our competitive capabilities from an international perspective, that shows that (the municipalities of, red.) Utrecht nor Amersfoort are able to compete with other large cities around the world. It therefore makes more sense that the Utrecht region would join forces with the region of Amsterdam to present a joint vision and proposition to the increase our competitive capabilities. [...] This is an example of **making use of economies of scale.** [...] However, **such processes are time consuming and demand significant effort from both parties.** From a municipal perspective, the aldermen and his colleagues have the assignment to strengthen the position of their own region. [...] So you can imagine that these people have a very **inward-looking perspective** when it comes to regional collaboration.” (IGOV15). The interviewees indicated that this shift towards more interregional collaboration is a trend that will become increasingly visible in the coming years. However, the interviewees also argued that this trend is primarily fueled by the current economic crisis, where the amount of governmental funding and subsidies decrease and regions and municipalities have to join forces as a result.

#### **5.3.1.4 Governmental Initiatives**

The interviewees indicated that the Regional Economic Board Utrecht is **currently assessing the needs of industries within the region**, in which companies themselves also play an influential role by indicating what is important to them. *“One of classical examples I hear the most, is a venture capital fund. We do not have such a fund at the moment nor have we ever had one in the past within this region. However, we are **currently engaged in talks with various parties to explore the possibilities of the creation of such a fund.** [...] However, similar concepts already exists and are called regional development authorities (regionale ontwikkelingsmaatschappijen). Examples of such authorities are OOST-NV and LIOF that provide financial capital to promising start-ups and initiatives. They also*

*participate on a board level of these companies. In short, they kind of are a type of venture capitalists, but they favor the interests of regional development (such as job creation and innovation, red.) over solely focusing on economic gains. However, it goes without saying that such regional development authorities also want to see their investments returned.” (IGOV16).* In summary, the interviewees indicated that **the municipality of Utrecht is working toward new initiatives to stimulate their regional ICT industry**, of which the outcome remains to be witnessed and analyzed accordingly.

### 5.3.2 Municipality of Veenendaal – Food Valley Region (Utrecht/Veluwe Region)

**Veenendaal** is a municipality within the province of Utrecht and has approximately 63,000 inhabitants. Veenendaal is **part of the region informally called the Food Valley**, being a regional collaborative effort between multiple governments (e.g. Barneveld, Ede and Wageningen) and other stakeholders to promote economic activity within the prominent agricultural sector. **The ICT industry accounts for the largest share of jobs offered** within the municipality of Veenendaal, accounting for 7,6% of the population in 2010 (Veenendaal, 2011). Due to the prominence of the ICT industry within the municipality, Veenendaal aims to profile itself as an **attractive municipality for ICT entrepreneurs**. Veenendaal therefore often refers to itself as Veenendaal ICT-Stad (Veenendaal ICT City). It is also the main sponsor of CoopFoodValley, a cooperative network in which ICT companies take part that are located in the Food Valley.

The interview was conducted with a civil servant bearing the title **“program coordinator Veenendaal ICT”**. As the title implies, the interviewee is responsible for monitoring the needs of the ICT industry within the region, as well as to organize various activities to bring the ICT industry of Veenendaal and the responsible governmental representatives closer together. The interview protocol utilized during the interview can be found in Appendix F.

#### 5.3.2.1 Regional Aspects

The interviewee indicated that the municipality of Veenendaal has a strongly diverse economic structure in which multiple types of industry are represented. A drawback mentioned of this diverse structure, is *“the **lack of a clear profile** that makes Veenendaal appear to be colorless and uninteresting to outsiders (such as investors and entrepreneurs, red.)” (IGOV17)*. The municipality of Veenendaal aims to change this situation by placing additional **emphasis on the already well-represented ICT industry**. *“We regard **the ICT industry as an ideal industry to serve as an engine for growth, innovation and sustainability for the entire business landscape** in Veenendaal and other domains such as education, health care and shopping. [...] We also aim to profile Veenendaal as the place where the magic happens, the ICT-city within the successfully developing Food Valley.” (IGOV18).*

To achieve this desired central role as ICT-city within the Food Valley, multiple goals were defined that the municipality of Veenendaal wants to have achieved by 2015. Among these goals are to *“increase awareness among industries that the ICT industry in **Veenendaal is able to accelerate their***

*path towards sustainability and economic development” (IGOV19) and to “increase awareness among the population that **the ICT industry** (in Veenendaal, red.) **can be an engine for change and sustainability** within multiple public domains such as education, research, shopping and health care.” (IGOV20). In addition, the interviewee mentioned that Veenendaal is also **aiming to achieve a “strong reputation as an ICT-city on higher administrative levels within the Food Valley, as well as within the province of Utrecht.” (IGOV21).***

### 5.3.2.2 Contacts with the ICT Industry

The interviewee indicated that **limited knowledge of the software industry is possessed by civil servants** creating policies. *“We see ourselves as profilers of our ICT industry: **we facilitate and connect companies** together. We aim to bring the people together to achieve the goals I mentioned before. [...] However, I do have to admit that **our budget is really small**. We have some cash, but not much. We see ourselves as **bridge-builders**: our municipal council (consisting of the mayor and aldermen, red.) has a similar attitude.” (IGOV22). When asked how Veenendaal remains informed about the status of the local ICT industry, the interviewee indicated that **Veenendaal places “strong emphasis on connecting software companies within our industry with each other, as well as with us by means of an ICT platform. This ICT platform consists primarily of CEOs and other influential industrial representatives who are willing to negotiate with us and improve the overall status of our region. [...] We also maintain ties with (the cooperative network, red.) CoopFoodValley because of their role as a market place where exchange (e.g. of knowledge, goods and services, red.) among software companies takes place.” (IGOV23).***

When asked whether the communication occurring between the ICT industry and the municipality of Veenendaal occur in a proactive or reactive manner, the interviewee indicated that *“both means of communication are important. [...] We **maintain a proactive communicative stance** when it comes to the orchestration of the ICT platform and our ties with CoopFoodValley. In addition, we also created a separate page on the website of our municipality containing our vision on where our ICT industry should be heading in the future. On this page, **people working in the software industry can leave their comments and either express their support or dismay** concerning our plans. We then get back to them, if we can, to exchange thoughts. [...] We also publish our plans in newspapers and communicate this at various gatherings, but the latter means of communication are one-way traffic and therefore less interactive.[...] Besides, we sometimes also **invite several people over from the industry to discuss our plans** and to get their opinion on what we could do to improve our plans for the future.” (IGOV24). According to the interviewee, **software companies involved in any of the aforementioned communication channels are satisfied with the current way in which communication with the software industry occurs.** Finally, the interviewee indicated that there are *“**dedicated and designated people** (including third-parties, red.) whom software companies can contact in case they have any questions related to municipal affairs.” (IGOV25).**

### 5.3.2.3 Interregional Governmental Collaboration

The municipality of **Veenendaal communicates its vision and plans for the local ICT industry to other municipalities** that are part of the Food Valley. *“We really see the Food Valley as our community. We profile our municipality as the ICT-city within the region, and it is therefore in our interest to communicate our plans as clearly as we can. [...] In addition, municipalities that are part of the Food Valley are more or less obliged to communicate their plans in same way as we do. We deliberately chose to work together as one region (the Food Valley, red.) – we are not doing this for fun, you know. [...] The current economic climate more or less forces us to **scale up and cooperate.**” (IGOV26). However, the interviewee mentioned that during crucial moments where competition may arise between municipalities, for instance to attract an investor, **every municipality eventually “acts in their own interest, rather than looking at the overall well-being and development of our region.”** (IGOV27). The interviewee indicated that **this behavior can be considered entirely “normal and logical.** Aldermen, in the end, are responsible for the results of their own municipality. If they want to be re-elected, they better make sure that the overall situation of their own municipality has progressed instead of allowing another municipality within the Food Valley to grab an opportunity at the cost of their own (municipality, red.)” (IGOV28).*

### 5.2.3.4 Governmental Initiatives

The interviewee indicated that the municipality of Veenendaal has a **careful attitude with regard to directly supporting the local ICT industry** through initiatives such as purchasing goods and services or providing interest-free financial capital. *“Like any other governmental institution, you really have to **avoid any possible distortion of competition.** [...] This is why we do not prefer to take on a proactive role to support the software industry. [...] We therefore primarily see ourselves, just as I mentioned before, as a **bridge-builder and facilitator.** We aim to bring software companies together, including ourselves, to facilitate the exchange of mutually beneficial knowledge and to promote inter-organizational partnerships.” (IGOV29). In addition, although not solely applicable to the ICT industry, Veenendaal aims to *“forge alliances with research and educational institutions to reach an optimal balance between educational programs offered by such institutions and the needs of companies located within our region.”* (IGOV30). Apart from such facilitating initiatives, the interviewee repeated that *“we prefer to do as much as we can to support our local software industry, albeit as a bridge-builder and facilitator rather than a powerful player.”* (IGOV31).*

## 6 Survey Results

The previous section presented the results of the case studies conducted with software companies, cooperative networks and governmental representatives. In this section, the results of the survey are presented along with an overview of interesting patterns found. This section utilizes the same structure as the survey in order to maintain consistency with the order in which the categories and their belonging questions were presented to the survey participants. By means of assessing similarities and differences among responses given by survey participants, patterns are presented to provide insight and enhance the understanding of the way in which regional software ecosystems function and operate. In addition, tables are also provided based on output produced by SPSS. The tables are presented throughout this section contrary to being part of a separate appendix for the sake of simplicity and overview, since plenty frequent references to tables are made throughout this section and Section 7 (Recommendations).

### 6.1 Response Rate

Providing an accurate estimation of the response rate to the survey is an arduous if not impossible assignment. First, multiple efforts were made to promote the survey via online communication channels such as multiple postings in LinkedIn groups, press coverage, word of mouth and banners on websites (see Section 3.2.2.3 for a complete overview of all initiatives undertaken). It remains unknown how many software companies filled out the questionnaire after having been redirected by said sources. Second, although 174 software companies received an invitation by means of a personalized e-mail including a description of the research project and a link to the online survey, it remains unknown what share of these invitees decided to respond due to the anonymous nature of the survey.

After the deadline to participate in the survey had passed on 18 July 2013, the dataset was first cleansed before being subject to analyses. In total, 23 respondents filled out the survey. After an initial scan on completeness to check whether all questions had been answered by the respondents, 3 cases were found to be incomplete and were therefore removed from the dataset. Afterwards, a consistency check was performed to see whether all respondents filled out the survey in a similar manner. During this check, minor adjustments were made to three cases where erroneous values by means of wrong formatting was provided (e.g. 10k instead of 10000, 5% instead of 5). Furthermore, the answer given to one question involving annual revenue by one respondent was altered on request (via e-mail) due to a wrong estimation provided. After the data cleansing procedure, 20 cases were considered valid and were therefore included in the final dataset.

It should be noted that the low amount of respondents did not allow us to perform meaningful stratified sampling and cross-regional analyses, for instance to compare the perceived benefits of regional partnering of large software companies versus small software companies. We therefore do not delve into advanced statistics such as correlation analyses and instead stick with comparisons based on counted occurrences, percentages, means and modes.

The digital questionnaire (found at [www.softwarein nederland.nl](http://www.softwarein nederland.nl)) including the invitation letter as provided to the survey participants has been included in the appendix (Appendix H).

## 6.2 General Information

To provide a contextualization of the dataset, respondents were first asked multiple questions about general organizational characteristics. Concerning the **business archetype** of the respondents, the majority (95%;  $N=19$ ) indicated to be a product software company whereas one respondent (5%;  $N=1$ ) indicated to be a reseller (see Table 10). These answers, however, are not representative for the entire array of business activities conducted by the respondents. For instance, a respondent may indicate to allocate 55% of its organizational capacity to reselling and 45% to producing software products. Although the latter software vendor would be classified as a reseller, it may very well derive 70% of its revenue from software products.

**Table 10: Respondents by business archetype**

| <i>BU. Which of the following options best describes your business?</i>                    | N  | %  |
|--|----|----|
| <b>BU1.</b> Software products  | 19 | 95 |
| <b>BU2.</b> Embedded software  | 1  | 5  |
| <b>BU3.</b> Delivery of software projects (tailor-made software) or other related services | 0  | 0  |
| <b>BU4.</b> Consulting in the software industry or closely related to it                   | 0  | 0  |
| <b>BU5.</b> Reselling  | 0  | 0  |
| <b>BU6.</b> Other  | 0  | 0  |

Concerning the **number of people employed** at the organizations of the respondents (measured in full-time equivalents (FTE)), 11 organizations (55%;  $N=11$ ) can be classified as small, 5 organizations (25%;  $N=5$ ) as medium, and 4 respondents (20%;  $N=4$ ) as large organizations (see Table 11). It should be noted that companies with less than 5 FTE were excluded from participation in this research project, hence the minimum threshold of 5 FTE for small organizations.

**Table 11: Number of employees at the end of 2012 (measured in full-time equivalents)**

| <i>FTE. Personnel at the end of 2012 measured in full-time equivalents</i> | N  | %  |
|--|----|----|
| <b>FTE1.</b> Small (5-25 employees)  | 11 | 55 |
| <b>FTE2.</b> Medium (26-99 employees)                                      | 5  | 25 |
| <b>FTE3.</b> Large (100 or more employees)                                 | 4  | 20 |

When looking at the **geographical distribution** of the respondents among the 12 provinces in the Netherlands, 3 respondents (15%) are located in Gelderland, 2 (10%) in Limburg, 2 (10%) in Noord-Brabant, 3 (15%) in Noord-Holland, 2 (10%) in Overijssel, 3 (15%) in Utrecht and 5 (25%) in Zuid-

Holland (see Table 12). This means that the provinces of Drenthe, Flevoland, Friesland, Groningen and Zeeland are not represented in the dataset. Although respondents were asked to enter the municipality in which they are located, the dataset does not allow to perform meaningful cross-regional or cross-municipal analyses due to the low amount of responses.

**Table 12: Overview of location of headquarters of respondents by provinces**

| <i>PV. Please indicate in which of the following provinces your company is headquartered.</i> | N | %  |
|---|---|----|
| <b>PV1.</b> Drenthe   | 0 | 0  |
| <b>PV2.</b> Flevoland   | 0 | 0  |
| <b>PV3.</b> Friesland   | 0 | 0  |
| <b>PV4.</b> Gelderland  | 3 | 15 |
| <b>PV5.</b> Groningen   | 0 | 0  |
| <b>PV6.</b> Limburg   | 2 | 10 |
| <b>PV7.</b> Noord-Brabant   | 2 | 10 |
| <b>PV8.</b> Noord-Holland   | 3 | 15 |
| <b>PV9.</b> Overijssel  | 2 | 10 |
| <b>PV10.</b> Utrecht  | 3 | 15 |
| <b>PV11.</b> Zeeland  | 0 | 0  |
| <b>PV12.</b> Zuid-Holland   | 5 | 25 |

Survey participants were also asked what percentage of their **revenue came from international markets** in 2012. As can be seen in Figure 8, a majority (40%; N=8) of respondents indicated that approximately 1-10% of their total revenue came from international markets in 2012. Interesting to mention, is that the respondents that derive 41-50%, 51-60% or 61-70% of their revenue from international markets are either classified as large-size companies (100 or more employees) or medium-size companies (26-99 employees) that were founded before the year 2000, or as small-size companies (5-25 employees) founded after the year 2010 with a web-based product portfolio.

### 6.3 Business Models & Organization

Multiple questions were directed at the business models used by the survey participants, as well as several organizational and strategic aspects. Survey participants were first asked how well four statements about the **growth of their firm** to achieve economic expansion described their firm. With economic expansion, we mean an increase in the amount of goods or services offered paired with an increase in revenue. For instance, respondents had to judge statements such as “*Growth is the most importance objective of our firm*” and “*Our firm must grow even if it means we would need to take more risks*” on a 5-point Likert scale (see Table 6). This scale ranged from 1-5, with the values being:

- 1 – “strongly disagree”
- 2 – “disagree”
- 3 – “do not agree or disagree”

4 – “agree”

5 – “strongly agree”

On average, the survey participants responded mildly positive ( $\mu = 3,50$ ) about whether growth is one of the key objectives of their firm (**GR1**). However, by means of the mode ( $Mo = 4$ ), a slight tendency to agree can be seen (the mode is the most frequently chosen answer, indicating that most respondents agree with the given statement). Despite the apparent importance of achieving growth, do firms indicate to be careful with regard to realizing growth at the expense of profitability ( $\mu = 3,40$ ;  $Mo = 4$ ) (**GR2**). Respondents indicated to not agree or disagree with regard to whether or not their firm should seek to realize growth, even it that would mean to take more risks ( $\mu = 3,00$ ;  $Mo = 4$ ) (**GR3**). When specifically addressing the desire to achieve growth in international markets, respondents indicated to be ambitious ( $\mu = 3,95$ ;  $Mo = 4$ ) (**GR4**). When looking at the percentage of revenue stemming from international markets (2012) as shown in Figure 9, 18 out of 20 survey participants responded to have already expanded their presence beyond the Netherlands. In addition, as also acknowledged during the case study interviews, firms are more than ever before within reach of larger potential customer bases thanks to modern technologies such as cloud and app stores. These technologies render geographical proximity almost irrelevant to purely transfer goods or services to customers located farther away.

**Table 13: Item statistics about the importance of economic growth**

| <i>GR. How well do the following statements describe the growth of your firm?</i>      | N  | Mean | Std. Dev. | Mode |
|--|----|------|-----------|------|
| <b>GR1.</b> Growth is the most important objective of our firm                         | 20 | 3,50 | ,946      | 4    |
| <b>GR2.</b> The growth of our firm must not take place at the expense of profitability | 20 | 3,40 | ,821      | 4    |
| <b>GR3.</b> Our firm must grow even if it means that we would need to take more risks  | 20 | 3,00 | 1,124     | 4    |
| <b>GR4.</b> We aim at strong growth in international markets                           | 20 | 3,95 | ,826      | 4    |

Finally, survey participants were asked about the **nature and number of their software products** (measured in software product lines) **offered**. As shown in Table 14, 17 respondents (85%) sell their products to private businesses (i.e. firms), 2 respondents (10%) sell their products to the public sector (i.e. governments) and 1 respondent (5%) indicated to sell its products to consumers (private individuals). Furthermore, as shown in Table 15, 5 respondents (25%) indicated to have one product or product line, 8 respondents (40%) have 2 or 3 products or product lines and 7 respondents (35%) have more 4 or more products or product lines.

**Table 14: Respondents by product types offered**

| <i>PDT. To what customer segments do you sell your products or services?</i> | N  | %  |
|--|----|----|
| <b>PDT1.</b> Private businesses (i.e. firms)                                 | 17 | 85 |
| <b>PDT2.</b> Public sector (i.e. governments)                                | 2  | 10 |
| <b>PDT3.</b> Consumers (private individuals)                                 | 1  | 5  |

**Table 15: Respondents by number of products / product lines offered**

| <i>PDN. To what customer segments do you sell your products or services?</i> | N | %  |
|--|---|----|
| <b>PDN1.</b> 1 product / product line  | 5 | 25 |
| <b>PDN2.</b> 2-3 products / product lines                                    | 8 | 40 |
| <b>PDN3.</b> 4 or more products / product lines                              | 7 | 35 |

## 6.4 Regional Government Relations

In order to gauge the sentiment among software companies with regard to the performance of the governments within their region, multiple questions were directed at the perceived importance of governments, what activities governments organize and companies take part in, and how companies would rate their relationships with governments located within their region.

Software companies were first asked to indicate **how important their own staff, customers, governments, investors, suppliers and media are** with regard to their company's economic value in the next 3-5 years. This was done to get an indication of how important governments are considered to be compared to other types of stakeholders. Survey participants were able to judge the importance of the stakeholders on a 5-point Likert scale (see Table 7), with the values being:

- 1 – “not used”
- 2 – “not important”
- 3 – “slightly important”
- 4 – “important”
- 5 – “very important”

The survey participants indicated that their own staff ( $\mu = 4,55$ ;  $Mo = 5$ ) and customers ( $\mu = 4,80$ ;  $Mo=5$ ) are by far their most valuable stakeholders concerning the economic value of the survey respondents. Media ( $\mu = 3,20$ ;  $Mo = 3$ ) such as newspapers and social media are regarded as slightly important and are, as mentioned during the case studies, primarily used for marketing and sales purposes. The respondents judge investors ( $\mu = 2,50$ ;  $Mo = 2$ ) and suppliers ( $\mu = 2,45$ ;  $Mo = 3$ ) to be of lesser importance. Although investors were not specifically addressed during the case study interviews, did software companies mention multiple times that the geographical distance of their suppliers has become almost irrelevant due to the intangible nature of software and modern delivery

models (e.g. SaaS and cloud). Governments ( $\mu = 2,85$ ;  $Mo = 3$ ) are regarded as slightly important, with a slight tendency to being rated as not important.

**Table 16: Item statistics about the perceived importance of different stakeholders to the economic value of participants in the next 3-5 years.**

| <i>IN. Please indicate how important the following stakeholders are to your company's economic value in the next 3-5 years.</i> | N  | Mean | Std. Dev. | Mode |
|---|----|------|-----------|------|
| <b>IN1.</b> Own staff   | 20 | 4,55 | ,510      | 5    |
| <b>IN2.</b> Customers   | 20 | 4,80 | ,410      | 5    |
| <b>IN3.</b> Government  | 20 | 2,85 | ,933      | 3    |
| <b>IN4.</b> Investors   | 20 | 2,50 | 1,051     | 2    |
| <b>IN5.</b> Suppliers   | 20 | 2,45 | ,759      | 3    |
| <b>IN6.</b> Media (e.g. newspapers, social media)   | 20 | 3,20 | 1,056     | 3    |

Survey participants were also asked to indicate **what business they have with regional governments**, to get an overall impression of regional governmental activity (see Table 8). 35% ( $N=7$ ) of all survey participants indicated that regional governments purchase their products or services. Such behavior is confirmed by the case study participants, showing that governments often serve as (launching) customers to support the economic activity of software companies located within their own region. Apart from purchasing their products or services by regional governments, did the majority of the survey respondents indicate that little to no other governmental activities apply to their company. Furthermore, survey participants were able to add any other governmental activities to the list that are applicable to their company. None other activities, however, were added.

**Table 17: Item statistics about regional government activities and their utilization**

| <i>GA. Which regional government activities apply to your company?</i>                                 | N | %  |
|--|---|----|
| <b>GA1.</b> Defining laws, setting policies, enforcing rules   | 2 | 10 |
| <b>GA2.</b> Purchasing our products/services   | 7 | 35 |
| <b>GA3.</b> Competing with our products/services   | 1 | 0  |
| <b>GA4.</b> Advocating for the interests of our company/industry                                       | 0 | 0  |
| <b>GA5.</b> Providing capital  | 1 | 5  |
| <b>GA6.</b> Reducing cost of capital by offering loans or loan guarantees                              | 1 | 0  |
| <b>GA7.</b> Providing knowledge infrastructure (e.g. networks, events)                                 | 1 | 5  |
| <b>GA8.</b> Providing software infrastructure (e.g. fiberglass, services, other relevant public goods) | 1 | 5  |

Software companies were asked to judge various statements on the **performance of governments within their region**. The statements primarily concern the influence of regional governments have on regional software industries, including their role to support the software industry and their ability to do so. A 5-point Likert-scale was used again ranging from (1) strongly disagree to (5) strongly agree, similar to earlier survey questions. As can be seen in Table 9, respondents indicated that regional governments tend to not be sufficiently aware of the presence of software industries within their region ( $\mu = 2,75$ ;  $Mo = 3$ ) (**GO1**). This is coupled with a sentiment that regional governments neither

recognize the value regional software industries offer ( $\mu = 2,70$ ;  $Mo = 3$ ) (GO2). When asking more in-depth questions such as whether regional governments understand the economics of the software industry, respondents indicated to disagree ( $\mu = 2,35$ ;  $Mo = 2$ ) (GO3). Similar results can be seen with regard to whether software companies can easily determine what the best way is to interact in a productive way with regional governments ( $\mu = 2,45$ ;  $Mo = 3$ ) (GO4) and whether it is easy to accomplish anything when working with the regional government ( $\mu = 2,75$ ;  $Mo = 3$ ) (GO7). An interesting and contrasting result, however, is that respondents judged more governmental involvement to be beneficial to their business ( $\mu = 3,35$ ) with a mode of 4, indicating a slight tendency to agree (GO5). Software companies therefore do seem to appreciate regional governmental involvement, but are not satisfied with the current way in which are organized and go about. A similar sentiment was gauged during the case study interviews, although the case study participants were divided on whether increasing regional governmental involvement is a blessing or a curse (e.g. depending on whether or not the government purchases their products). Finally, survey participants responded neutral with a slight tendency to disagree to whether regional governments use unfair rhetoric when talking about regional software industries ( $\mu = 2,85$ ;  $Mo = 3$ ) (GO6).

**Table 18: Item statistics about the perceived performance of regional governments**

| GO. Please indicate whether you agree or disagree with the following statements.  | N  | Mean | Std. Dev. | Mode |
|---|----|------|-----------|------|
| GO1. The government in our region is aware of the presence of our regional software industry  | 20 | 2,75 | ,851      | 3    |
| GO2. The government in our region recognizes the value of our regional software industry  | 20 | 2,70 | ,923      | 3    |
| GO3. The regulators and policy makers in our region who have influence over our software industry, understand the economics of our industry | 20 | 2,35 | ,671      | 2    |
| GO4. It is easy to determine the best way to interact in a productive way with the regional government                                      | 20 | 2,45 | ,759      | 3    |
| GO5. Additional government involvement is good for my business  | 20 | 3,35 | ,988      | 4    |
| GO6. The regional government often uses unfair rhetoric when talking about our industry   | 20 | 2,85 | ,489      | 3    |
| GO7. It is easy to accomplish anything when working with the regional government  | 20 | 2,75 | ,716      | 3    |

## 6.5 Regional Educational Institutions

To get an impression of how software companies judge the performance, influence and added value of educational institutions within their region, survey participants were first asked to indicate in **what kind of activities they engage with regional educational institutions**. As can be seen in Table 10, the majority of the respondents indicated to offer and fulfill student internships ( $N=16$ ; 80%) (EA1). Respondents were evenly divided on taking part in organizing seminars ( $N=11$ ; 55%) (EA2), giving guest lectures at educational institutions ( $N=10$ ; 50%) (EA4) and providing software for use at educational institutions ( $N=11$ ; 55%) (EA6). With regard to research conducted by educational

institutions, did 8 respondents (40%) indicate to take part in joint research projects of which the results are mutually beneficial (EA3), whereas receiving results of research projects relevant to their company (without participation) was applicable to 7 respondents (35%) (EA5). Respondents were also able to add any additional activities to the list of which they felt were not included. None of the respondents, however, made use of the ability to do so.

**Table 19: Item statistics of participation in educational activities**

| EA. Please indicate whether your company is involved in any of the following activities with regional educational institutions. | Yes (N)  | No (N)   | Don't know (N) |
|---|----------|----------|----------------|
| EA1. The offering and fulfillment of student internships at my company  | 16 (80%) | 3 (15%)  | 1 (5%)         |
| EA2. Taking part in organizing seminars   | 11 (55%) | 9 (45%)  | 0 (0%)         |
| EA3. Taking part in joint research projects of which the results are mutually beneficial  | 8 (40%)  | 12 (60%) | 0 (0%)         |
| EA4. Giving guest lectures at universities or higher educational institutions   | 10 (50%) | 10 (50%) | 0 (0%)         |
| EA5. Sharing of results of research projects relevant to my company   | 7 (35%)  | 11 (55%) | 2 (10%)        |
| EA6. Providing our software for use at educational institutions   | 11 (55%) | 9 (45%)  | 0 (0%)         |

Survey participants were also asked about the **importance, performance and influence of regional educational institutions**. As such, survey participants were confronted with multiple statements that had to be judged on a 5-point Likert-scale, that similar to previous questions again ranged from (1) strongly disagree to (5) strongly agree. As shown in Table 11, respondents first had to indicate whether maintaining relationships with educational institutions is valuable to their organization. Overall, software companies judge relationships with educational institutions to be of great value to their organization ( $\mu = 4,25$ ;  $Mo = 4$ ) (EP1) and see clear benefits to collaborate ( $\mu = 3,95$ ;  $Mo = 4$ ) (EP2). Although software companies already judge relationships with educational institutions to be of great value, do respondents also indicate to be interested in increasing the level of collaboration with educational institutions within their region ( $\mu = 4,00$ ;  $Mo = 4$ ) (EP3). Contrasting this enthusiasm, were respondents less confident (neutral) about whether educational institutions are aware of the needs of their companies (which includes educational programs offered, next to research conducted) ( $\mu = 3,00$ ;  $Mo = 3$ ) (EP4). Respondents were even less positive about the complementarity of the research performed by educational institutions within their region ( $\mu = 2,90$ ;  $Mo = 3$ ) (EP5). Despite the latter signaling a mismatch of research interests, were respondents neutral to mildly positive with regard to the ease of getting in contact with educational institutions within their region ( $\mu = 3,30$ ;  $Mo = 3$ ) (EP6). Finally, as also argued during the case study interviews, do respondents indicate that it is perceived difficult to exert influence over educational programs offered by educational institutions within their region ( $\mu = 2,55$ ;  $Mo = 2$ ) (EP7). Mismatches between theory taught at educational institutions and the situation in practice at software companies was reported to be a commonly experienced problem.

**Table 20: Item statistics of perceived importance of (regional) educational institutions**

| <i>EP1. Please indicate whether you agree or disagree with the following statements.</i>  | N  | Mean | Std. Dev. | Mode |
|---|----|------|-----------|------|
| <b>EP1.</b> Maintaining relationships with higher education institutions (HBOs) and universities within my region is important to my company                  | 20 | 4,25 | ,716      | 4    |
| <b>EP2.</b> The benefits of collaborating with HBOs and universities within my region are clear to my company   | 20 | 3,95 | ,826      | 4    |
| <b>EP3.</b> My company would like to cooperate more actively with HBOs and/or universities located within my region   | 20 | 4,00 | ,725      | 4    |
| <b>EP4.</b> HBOs and universities are aware of the needs of software companies located within my region   | 20 | 3,00 | 1,076     | 3    |
| <b>EP5.</b> The research performed by HBOs and universities complement the needs of software companies within my region                                       | 20 | 2,90 | ,968      | 3    |
| <b>EP6.</b> It is easy to get in contact with HBOs and/or universities within my region   | 20 | 3,30 | 1,031     | 3    |
| <b>EP7.</b> The software industry within my region is able to exert influence over the educational programs offered by HBOs and universities within my region | 20 | 2,55 | ,605      | 2    |

## 6.6 Regional Partnering

To get an impression of the opinions of software companies on regional partnering with other software companies, survey participants were also asked to indicate **what in what kind of partnering initiatives they engage with other software companies located within their region**. As can be seen in Table 12, maintaining contact with customers is the most popular activity conducted within the region of where companies are located ( $N=9$ ; 45%), followed by organizing or visiting regional fairs such as promotional events and entrepreneurial gatherings ( $N=7$ ; 35%). Other types of activities seem to garner less attention, among which are membership of a regional network such as CoopFoodValley or CoopUtrecht ( $N=4$ ; 20%), shared R&D programs ( $N=3$ ; 15%), regional joint ventures with other software companies ( $N=2$ ; 10%), licensing product components together with other software companies to have more bargaining power and speaking volume ( $N=2$ ; 10%) and employee exchange programs ( $N=1$ ; 5%). The lack of interest in such regional partnering initiatives also became apparent during the case study interviews, where interviewees argued that a lack of perceived benefits withholds them from partnering with other software companies located within their vicinity.

**Table 21: Item statistics of participation in regional partnering initiatives**

| <i>RA. Which of the following forms of regional partnering are important to your company?</i> | N | Percentage (%) of respondents |
|---|---|-------------------------------|
| <b>RA1.</b> Employee exchange program   | 1 | 5%                            |
| <b>RA2.</b> Licensing product components  | 2 | 10%                           |
| <b>RA3.</b> Contact with customers in my region   | 9 | 45%                           |
| <b>RA4.</b> Regional joint ventures   | 2 | 10%                           |
| <b>RA5.</b> Shared R&D programs   | 3 | 15%                           |
| <b>RA6.</b> Organizing/visiting regional fairs  | 7 | 35%                           |
| <b>RA7.</b> Membership of regional network  | 4 | 20%                           |

Similar to the preceding sections concerning governmental and educational partnering, were respondents also asked to judge multiple statements on the **importance, influence and benefits of partnering with software companies located within their region**. A 5-point Likert-scale was again used, ranging from (1) strongly disagree to (5) strongly agree – similar to earlier survey questions. As seen in Table 13, respondents indicated to be neither aware nor unaware of what software products or services are produced by peer software companies within their region ( $\mu = 3,25$ ). However, a slight tendency to agree can be seen with a mode of 4 (**RP1**). An exact same mean ( $\mu = 3,25$ ;  $Mo = 3$ ) was calculated from the responses on whether software companies are willing to cooperate with each other within the region (**RP2**). When exploring regional partnering relationships with other software firms more in-depth, respondents have a neutral stance with a slight tendency to agree on whether software firms within their region are an important source for their innovative performance ( $\mu = 3,10$ ;  $Mo = 4$ ) (**RP3**). When comparing the contribution to innovative performance from customers within the vicinity of the respondents and customers located elsewhere, respondents indicated that geographical proximity matters little ( $\mu = 2,30$ ;  $Mo = 2$ ) (**RP4**). Although respondents indicated to have a neutral stance on the contribution to their innovative performance by peer companies within their region ( $\mu = 3,10$ ), are companies less positive about the overall added value regional partnering may have for their company ( $\mu = 2,85$ ;  $Mo = 3$ ) (**RP5**). Akin to geographical proximity between software companies and customers being indicated to matter little ( $\mu = 2,30$ ;  $Mo = 2$ ), do respondents indicate that the distance between their company and the location of their business partners is near irrelevant ( $\mu = 2,40$ ;  $Mo = 2$ ) (**RP6**). In summary, it can be argued that geographical proximity between software companies and their partners (whether businesses or customers) indeed matters little. This is in line with the results of the case study interviews.

**Table 22: Item statistics of perceived importance of regional business partnering**

| <i>RP. Please indicate whether you agree or disagree with the following statements</i>   | N  | Mean | Std. Dev. | Mode |
|--|----|------|-----------|------|
| <b>RP1.</b> I know what software products or services are produced by software companies located within my region  | 20 | 3,25 | ,967      | 4    |
| <b>RP2.</b> Software companies within my region are willing to cooperate with each other   | 20 | 3,25 | ,639      | 3    |
| <b>RP3.</b> Relationships with other software firms within my region are an important source for the innovative performance of my company                            | 20 | 3,10 | ,968      | 4    |
| <b>RP4.</b> Relationships with customers within my region are a greater source of innovative performance for my company, than customers located outside of my region | 20 | 2,30 | 1,081     | 2    |
| <b>RP5.</b> Regional cooperation with other firms has clear added value for my company   | 20 | 2,85 | ,933      | 3    |
| <b>RP6.</b> The greater the distance between my company and other software companies, the less effective the relationship tends to be                                | 20 | 2,40 | ,995      | 2    |

## 6.7 Information About Informant

Survey participants were also asked on **what organizational level they are active** (see Table 23). A distinction is often made between the management team (i.e. board members), upper management (e.g. sales and marketing directors), middle management (e.g. product managers, principal software architects) and others (e.g. junior programmers, customer service employees). 14 of the 20 respondents (70%) indicated to be part of the management team of their organization. This group of respondents was followed by 5 respondents being part of the upper management team (25%). A single other respondent (5%) indicated to be part of the middle management, with no respondents indicating to be active on any other organizational level.

**Table 23: Overview of respondents by organizational level**

| <b>LVL. On which level do you work in your company?</b> | <b>N</b> | <b>%</b> |
|---|----------|----------|
| <b>LVL1. Management team</b>                            | 14       | 70       |
| <b>LVL2. Upper management</b>                           | 5        | 25       |
| <b>LVL3. Middle management</b>                          | 1        | 5        |
| <b>LVL4. Other</b>                                      | 0        | 0        |

Finally, respondents were able to provide **feedback concerning points of improvements for the survey, or any other comments to support the software industry**. Although the majority of the feedback provided were best wishes and support regarding the research project, did one respondent argue that *“The focus is very much on “traditional” ways of meeting and collaborating. Using traditional terms as well, IT startups / companies meet with Meetups, support / sponsor Hackathons, or PubTalks and support their employees to speak at international conferences. Having our employees go to these kind of events is a “personal thing” of the employees, but we do support them. It’s not a company-to-company regional collaboration. It’s people wanting to meet up, not necessarily companies that want to meet up.”* Although the respondent is right with regard to activities taking place that transcend regions, is the purpose of this research to investigate whether regional partnering still matters. This feedback can therefore be perceived to be another comment to support the statement that geographical proximity matters little. Furthermore, the same respondent also argued that *“It feels like the questionnaire is also tailored towards “Dutch thinking” of regions. (50km) While a lot of software is produced with the world as a region. In our case customers, interns and universities “in Europe” feel very close by (as opposed to China). 50km is a region on a government level in the Netherlands, but not a “region” if you talk about software.”* Although the interviewee argued to feel that the questionnaire is tailored to *“Dutch thinking of regions (50 km)”*, this is actually true. Again, this research project aims to investigate whether the regional dimension is still a factor to take into account. The perception of the respondent is therefore accurate, with the statements being in line with the results gathered from both the case study interviews and the survey.

## 7 Recommendations

In this section, the case study results and survey results as described in Section 5 and Section 6, respectively, are analyzed and related to existing scientific work. The data is analyzed from the perspective of a regional innovation system (RIS) that has its focus on the firms, clusters and institutions present within a specific region, including interdependencies between actors within regions and to higher scope levels. To maintain a logical structural flow in which the recommendations are presented, this section is structured in the same order as in which the elements of a RIS were presented in Section 4.2.4 (see Figure 5).

The first subsection is oriented at the knowledge application and exploitation subsystem, describing relationships software companies maintain with peer software companies, customers, contractors, non-IT collaborators and competitors. The second subsection focuses on the knowledge generation and diffusion subsystem, analyzing the perspective software companies and cooperative networks have on public research organizations and educational organizations. Finally, the third subsection addresses policymakers (regional and local governments) and external sources influencing the RIS such as influences from other regional innovation systems, international organizations and the national government. Based on the analyses, recommendations are provided per subsection to enhance the functioning of the individual subsystems to the overall benefit of the entire regional innovation system.

References to scientific literature and empirical results are frequently made to support the provided problems and their resulting recommendations. When referring to results of the survey conducted, the identifier of a question is given including the relevant question number (e.g. **RP1**). For the sake of clarity and to maintain overview due to a large number of quotations (173), references to case study results are made by means of 'reference anchors'. These reference anchors are capitalized abbreviations including a unique identification number (e.g. **ICOOP17**). **ICOOP** refers to results stemming from interviews conducted with cooperative networks. Similarly, **ICOMP** refers to software companies and **IGOV** refers to governmental representatives. Although all reference anchors can be traced back to their original location within Section 5 for the case study results and Section 6 for the survey results, a complete overview of all the references provided including their anchors is provided in Appendix H.

### 7.1 Knowledge Application & Exploitation Subsystem

The knowledge application and exploitation subsystem consists of software companies, as well as their customers, contractors, non-IT collaborators and competitors within a region, including the vertical and horizontal partnership relations among them. This sub subsection outlines the most commonly experienced issues concerning regional business partnering and provides recommendations accordingly to improve the overall functioning of the knowledge application and exploitation subsystem.

### 7.1.1 Lacking Insight into Regional Industrial Activity

Software companies experience a lack of insight into the industrial activity within their own region. The arguments provided by case study participants (e.g. **ICOOP17**; **ICOOP22**; **ICOOP42**; **ICOOP43**; **ICOOP44**) and the relatively neutral stance of survey respondents ( $\mu = 3,25$ ; **RP1**) demonstrates that it remains largely unknown where other software companies are located within their region and what expertise these companies offer. This lacking insight in regional industrial activity hampers software companies in extending their regional network through cooperative relationships that may serve as access routes to (complementary) internal resources possessed by connected actors (Langlois, 1992; McEvily & Zaheer, 1999; Nohria, 1992).

Existing databases and registries (e.g. the registry of the Dutch Chamber of Commerce) are found to be opaque and lack information richness on the nature of the software companies registered such as products developed, types of customers served and reputation (**ICOOP44**). Regional cooperative networks, however, have demonstrated to be able (at least to a specific extent) to address and tackle this lacking insight into regional industrial activity, for instance through organizing networking events and maintaining contact databases. Their bird's-eye-view of regional economic activity may fulfill a central role in visualizing and mapping the presence of software companies within the region and the expertise offered. By creating a freely accessible database (in cooperation with governments and software companies) containing the aforementioned information, the veil that hangs over the industry may be lifted.

**Recommendation Industry 1:** *Identify, visualize and map the presence of software companies located within the region and their expertise offered. Regional competences are hereby identified, leading to increased awareness of software companies of regional opportunities.*

### 7.1.2 Lack of Perceived Benefits of Regional Partnering

A common reason provided by case study participants to ignore regional partnering, was that software companies are either too focused on their day-to-day activities, have never thought of the benefits regional partnering could yield, consider their company to be too distinct (e.g. too large, too small, or too specialized) from other software companies (**ICOOP5**; **ICOMP4**; **ICOMP5**; **ICOMP19**; **ICOMP33**; **ICOMP51**; **ICOMP55**; **ICOMP69**; **ICOMP71**; **ICOMP83**). In sum, software companies argue to experience a lack of perceived benefits of regional partnering. The latter was confirmed by the relatively negative response of survey participants with regard to the perceived added value of regional partnering ( $\mu = 2,85$ ; **RP5**). Software companies therefore seem to prefer to focus on their core business at hand, thereby ignoring potential benefits that regional partnering may yield (for instance, see Argote and Ingram (2000); Grant (1991); Zack (1999)). Furthermore, case study participants argued that geographical proximity of their potential partners matters little since software is an intangible good that can be transferred over any distance without complex logistical effort (**ICOOP18**; **ICOMP35**; **ICOMP69**). If logistical costs are thus of zero influence and no complementary customer base (such as the agricultural industry in the Food Valley region is located nearby (e.g. **ICOOP6**), software companies tend to ignore industrial activity within their own region

and search for the partner with the most attractive benefits regardless of their location. Multiple governmental representatives, on the other hand, argued that regional partnering may lead to regional specialization and competitive benefits, an increase in customers and regional complementarity effects sparking positive wealth creation. Since governments tend to have a high level view on regional industrial activity and regard the ICT industry as an enabler for other industries to thrive (e.g. **IGOV2**; **IGOV3**; **IGOV18**; **IGOV22**; **IGOV31**), governments could make an attempt to identify complementary industries to which software companies could sell their products or develop software for.

**Recommendation Industry 2:** *Identify complementary industries and customers to which software companies located within the region can sell their software to or develop software for, to spark regional specialization and economic value creation.*

### 7.1.3 Scaling up Regional Networking Initiatives

Cooperative networks who participated in the case studies argued that scaling up networking initiatives is required in order to achieve a greater extent of professionalism, more members and financial capital (e.g. **ICOOP45**; **ICOOP51**). Governmental representatives interviewed made similar remarks, being that scaling up inter-industrial and inter-municipal relationships are associated with greater influence and execution power (e.g. **IGOV15**; **IGOV26**). The argument provided was that by combining forces of multiple regions (e.g. municipalities), regional software industries become more attractive and interesting partners to do business with from a governmental, entrepreneurial and (international) investor's perspective. An example of a recent success mentioned by one of the case study participants is the planned arrival of a World Food Center to the Food Valley region (in the municipality of Ede). By means of successful and effective collaboration in the Food Valley among multiple municipalities, was the region favored over the municipality of Rotterdam. Best (1990) and Cooke (2002) discuss similar success stories and argue that linking regional networks to global partners can give regional networks access to valuable external resources such as knowledge, financial capital and market opportunities, in turn reinforcing the strength of regional networks. The same holds for linking regional networks to other regional networks, whether or not located within the same country. Scaling up business networking activities, however, demands the recognition, support and willingness of all stakeholders involved to scale up and requires funding to realize the process of doing so. In summary, the following recommendation is therefore formulated:

**Recommendation Industry 3:** *Explore the possibility of scaling up regional business networking activities to achieve greater influence and speaking volume, resulting in increased attractiveness to governments, entrepreneurs and (international) investors.*

### 7.1.4 Stimulating Export of Dutch Software Products

Case study participants indicated that product software export growth rates are hampered by a lack of knowledge of international markets and mental barriers withholding software companies from

entering international markets. Software firms often have no insight into international market environments (from both a cultural and economic perspective), do not possess international marketing knowledge, experience difficulties in transforming their software aimed at vertical markets to be applicable in foreign markets, and have no idea on how to deal with related challenges concerning human resource management (e.g. **ICOMP60**; **ICOMP61**). This is a missed opportunity, since survey respondents indicated to aim at strong growth in international markets ( $\mu = 3,95$ ;  $Mo = 4$  (**GR4**)). Empirical evidence shows that governmental assistance programs can successfully pave the way for domestic companies to engage in international business activities and fulfill a key role in stimulating firms to do so. As a result, mental barriers to internationalization are reduced while at the same time facilitating rising export growth rates (Czinkota & Ronkainen, 2007; Seringhaus & Rosson, 1990).

Furthermore, related to the former issue, it was argued that the Dutch product software industry in general has a strong focus on producing software aimed at vertical markets (**ICOMP60**). Such products are often tied to Dutch legislation and specific ways of working (**ICOMP61**). Although the Dutch software industry has a plethora of innovative and competitive financial software products to offer, do software companies often fail to acquire international market share. Multiple case study participants indicated that software companies could greatly benefit from governments promoting Dutch software products at peer governmental institutions, regardless of whether these institutions are located in the Netherlands or abroad (e.g. **ICOMP61**; **ICOMP80**).

**Recommendation Government 1:** *Explore the opportunity of developing internationalization-assistance programs by means of trade fairs, export and trade workshops, seminars and trade missions.*

**Recommendation Industry 4:** *Persuade governments to promote Dutch software products at peer governmental institutions, whether located in the Netherlands or abroad.*

### 7.1.5 A Long-Term Vision on the Dutch Product Software Industry

According to software companies and governmental representatives, the product Dutch software industry lacks a long-term vision on in what direction the industry should be heading in the future and what factors hamper the industry in moving forward (e.g. **ICOMP63**; **IGOV9**). Software companies and governmental representatives argued that the Dutch software industry should ask itself: “*What is our right as an industry to exist?*” (**ICOMP63**). Afterwards, the industry should find out in what way software companies are able to contribute to this right of existence by translating the needs stemming from society and businesses into products and services. By emphasizing the value the Dutch product software industry delivers (or is capable of delivering) to society and what barriers withhold the industry from doing so, governments and other institutions may be able to provide assistance accordingly. Trade organizations such as Nederland ICT and the Software~VOC that have a bird’s-eye-perspective of the industry and maintain dialogues with influential representatives, should aim to create and validate a long-term roadmap that explicates where the software industry should be heading in the coming ten years and what barriers withhold the industry in moving forward.

**Recommendation Industry 5:** *Product software trade organizations should create a long-term roadmap stating the right of existence of the Dutch product software industry, the major challenges and opportunities expected and what influence the Dutch product software industry has on the national economy.*

## 7.2 Knowledge Generation & Diffusion Subsystem

The *knowledge generation and diffusion subsystem* comprises two types of institutions that serve and operate primarily in the public domain, contrary to entities in the knowledge application and exploitation subsystem. These institutions produce and disseminate both tacit and codified knowledge, technical skills and competences (Autio, 1998). The public research institutions comprise entities that produce and disseminate technological knowledge that is generally publically available. Educational organizations, on the other hand, contribute to the regional skill base (e.g. employees and complementary knowledge) which the knowledge application and exploitation sub-system can make use of. Typical educational institutions are universities, vocational schools, or training institutions. The knowledge generation and diffusion subsystem is essential in a way that it provides inputs for industrial innovation processes by means of human capital, being either the education of graduate students becoming industry researchers, or through personnel mobility flowing from universities to nearby firms (Schartinger et al., 2002). This sub section outlines the most commonly experienced issues software companies and cooperative networks have concerning educational partnering and provides recommendations accordingly to improve the overall functioning of the knowledge generation and diffusion subsystem.

### 7.2.1 Bridging the Gap Between Theory and Practice

Case study participants signaled to experience a mismatch of the skills possessed by graduates and the skills required in practice (**ICOOP38**; **ICOOP40**; **ICOMP12**; **ICOMP46**; **ICOMP62**; **ICOMP66**; **ICOMP87**). A similar sentiment can be concluded based on the results of the survey, where respondents argued that the research performed by educational institutions often do not complement the needs of their company ( $\mu = 2,90$ ; **EP5**). In short, a gap between theory and practice is signaled. Although software companies signal this mismatch between theory and practice, one case study participant also argued that ICT is an inherently diverse discipline (**ICOMP8**). The plethora of research domains and types of software produced render it unrealistic to assume that there are graduates with a skillset that matches seamlessly with the demands of every single software company.

To tackle the mismatch between theory taught and skills demanded in practice, software companies have to intensify their relationships with regional educational institutions. At the same time, regional educational institutions will have to have an open attitude with regard to the initiation of such relationships. Survey data clearly shows that software companies consider maintaining relationships with educational institutions to be of vital importance ( $\mu = 4,25$ ; **EP1**). Despite this importance,

respondents also indicated that it is not always easy to get in contact with educational institutions within their region ( $\mu = 3,30$ ; **EP6**), nor are they able to exert influence over educational programs offered by educational institutions within their region ( $\mu = 2,55$ ; **EP7**). A clear opportunity can thus be distilled as also mentioned by case study participants (**ICOMP17**; **ICOMP32**; **ICOMP85**): an intensification of industrial-educational relationships to discuss both the curricula of educational programs as well as ongoing research projects.

When industrial-educational relationships are intensified, resources could be more easily be obtained by universities to support and fund their activities. Software companies, in return, will witness a flow of graduates with a skillset that more closely match the needs of their company. Organizing roundtable sessions in which representatives from software companies and educational institutions take place is recommended, which could be professionalized by means of a dedicated working group. This also reduces the argued ad-hoc communication style and lacking synergy between software companies and educational institutions. Case study participants indicated to be willing to support such joint initiatives by providing resources where necessary (e.g. **ICOMP13**; **ICOMP48**; **ICOMP73**; **ICOMP85**) and survey participants indicated to prefer cooperating more actively with educational institutions within their region ( $\mu = 4,00$ ; **EP3**).

**Recommendation Education 1:** *Intensify industrial-educational relationships by, for example, organizing roundtable sessions in which representatives from software companies and educational institutions take place. As a result, an attempt is made to harmonize the needs and demands of both software companies and educational institutions.*

## 7.2.2 Consistency of Relationships

Related to the former recommendation of intensifying industrial-educational relationships, did case study participants mention that continuity and consistency in a relationship are vital for long-term synergy and success between actors involved (e.g. **ICOMP44**; **ICOMP49**; **ICOMP50**). By creating dedicated communication channels such as quarterly roundtable sessions, appointing representatives and discuss and exchange opinions at e.g. routinely organized seminars, consistency in the relationships can be achieved and maintained contributing to mutual understanding and alignment of goals.

**Recommendation Education 2:** *Establish dedicated communication channels (e.g. account managers or relationship managers) to achieve and maintain consistency in relationships between software companies and educational institutions to enhance mutual understanding and alignment of goals.*

## 7.2.3 A Healthy Flow of Graduates

In addition to the signaled gap between theory taught and skills demanded of graduates, case study participants emphasized the importance of a healthy and high quality flow of graduates that are considered to be the well of life upon which the software industry draws to sustain, thrive and

remain dynamic (e.g. **ICOOP15**; **ICOMP12**; **ICOMP62**; **ICOMP63**; **ICOMP65**; **ICOMP66**; **ICOMP87**; **IGOV11**). Universities provide crucial inputs for industrial innovation processes by means of human capital, either through the education of graduate students becoming researchers or practitioners or through personnel mobility flowing from universities to nearby firms (Schartinger et al., 2002). In reality, however, a shortage of graduates with a discipline relevant to the software industry can be witnessed. Instead of attracting more potential students to opt for a discipline relevant to the software industry, case study participants indicated that fierce rivalry between software companies often occurs to attract the best graduates. Governmental representatives argued that the latter is a sign of immaturity of the software industry. Rather than undertaking joint efforts to tackle the shortage of ICT students, does the situation strongly resemble the ‘it’s every man for himself’ strategy (**IGOV11**).

One case study participants argued that the shortage of graduates can be witnessed in any region in the Netherlands (**ICOMP66**). Geographical proximity of universities and other educational institutions in general was found to be of little importance with regard to attracting graduates (**ICOMP58**). Case study participants indicated that the nature of the job itself and employment benefits are decisive factors by which graduates get attracted, not the regional dimension. However, despite individual efforts undertaken by software companies to attract graduates, does the lack of a sufficient amount of graduates persist. The benefits, dynamism, opportunities and challenges to study a discipline relevant to the software industry should be made clear. Influential and charismatic representatives of the software industry could bundle their powers to demonstrate the attractiveness of the software industry to convince a greater amount of younger people to pursue and opt for a study or career related to or in the software industry.

**Recommendation Education 3:** *Bring figureheads of the Dutch software industry together to demonstrate the attractiveness of studies relevant to the domain of the software industry such as informatics and information science. Such a dedicated campaign will spark interest and attract more students to opt for a career in the software industry.*

### **7.3 Policy and External Influences**

The policy component in a regional innovation system consists primarily of local, regional (provincial) and national government. Policy actors at a regional level can play effective roles in shaping regional innovation processes, as long as there is a sufficient extent of regional autonomy from both a legal and financial perspective to formulate and implement innovation policies (Cooke et al., 2000; Cooke & Memedovic, 2003). Furthermore, influences from external forces are also taken into account (Autio, 1998). For instance, a regional innovation system can be subjected to influences from other regional innovation systems, the overarching national innovation system, the European Union or international organizations. These external actors are able to influence the regional innovation system by means of e.g. complementarity, competition, policy interventions, funding and subsidies for innovation (Autio, 1998).

When it comes to formulating recommendations for governments, it has to be noted that Tödtling and Trippel (2005) argue that there is no 'one-size-fits-all' policy program that can be used in an undifferentiated matter to support any regional economic ecosystem such as the software industry. Regions differ from each other in many respects, primarily due to differences in intangible assets that are of vital importance to turn tangible assets into economic development (Lorenzen, 2007; Rutten & Boekema, 2007). Among differences witnessed among the different regions studied during the case studies are differences in intangible assets being social capital (Field, 2003; Iyer et al., 2005) and institutions such as a shared culture of shared trust and practices (Klein Woolthuis et al., 2005; Nelson & Winter, 1982).

As such, its own strengths and weaknesses and governmental policies need to be formulated accordingly. During the case study interviews, the difference between regional innovation systems of the regions Delft, Utrecht and Food Valley became apparent. Not only did the regions vary in their structure, culture and composition (e.g. difference in the types of software produced, mentality of the labor force and nearby complementary industries), but also strongly differ in the willingness and attitude of stakeholders such as governmental representatives to look beyond their own region. These inherent differences per region make it an arduous task to formulate undisputable recommendations. However, several overarching and overall recommendations can be provided based on the data gathered from the case studies and the survey respondents.

### 7.3.1 Lacking Awareness, Insight and Incongruence of Interests

Case study participants and survey respondents indicated that governments, similar to software companies themselves, tend to be unaware of the presence of the presence of software industries within their region ( $\mu = 2,75$ ; **GO1**) (**ICOOP24; ICOOP26; ICOOP49; ICOMP6; ICOMP23; ICOMP52; ICOMP74**) and that governments tend to not recognize the economic value regional software industries offer ( $\mu = 2,70$ ; **GO2**) (**ICOOP9; ICOOP10; ICOOP25; ICOOP49; ICOOP54**). The same holds for the sentiment that policy makers do not understand the economics of the software industry ( $\mu = 2,35$ ; **GO3**) (**ICOOP13; ICOOP25; ICOOP27; ICOOP34; ICOMP7**) and that accomplishing anything with regional governments is an uneasy task ( $\mu = 2,75$ ; **GO7**) (**ICOOP46; ICOOP47; ICOOP48**). Governmental representatives, on the other hand, argued that the software industry lacks a unified voice (**IGOV7; IGOV9**). Software companies, in turn, argue that the industry speaking with a unified voice is unrealistic due to the inherent diversity of the software industry (e.g. **ICOMP8**). Another argument provided, was that software companies should not expect governments to solve their problems, nor are policymakers required to have in-depth knowledge about the software industry (e.g. **IGOV3; IGOV4**). As mentioned by a governmental representative: *"A civil servant is responsible for shaping an effective framework and atmosphere in which businesses can unleash their maximum potential. They do this by recognizing and defining prerequisites (randvoorwaarden, red.) such as the attraction and retainment of talented employees within the region, providing a modern digital infrastructure, manage business areas (bedrijventerreinen, red.), and so forth."* (**IGOV3**).

Although software companies tended to agree with the latter statement, did they argue responsible civil servants should at least know what the software industry within their region is up in order to

create effective policies (**ICOOP33**). Asheim et al. (2003) support the latter statement and argue that companies and governments should have common ground and mutual understanding. The latter two conditions are essential to prevent governments supplying instruments to companies on an individual basis that are then applied in an uncoordinated manner, resulting in ineffective innovation stimuli. Software companies mentioned that the intangible nature of software products, the relatively invisible production processes and long time required to go from concept to product are the primary causes why governmental interest in their industry is often lacking (e.g. **ICOOP50**; **ICOMP42**). In summary, software companies argue that governments should explore regional software industries in practice to see what value they offer, whereas governmental representatives argue that software companies should collectively organize themselves to speak with a unified voice, in order to effectively communicate the needs and challenges of their industry to support the creation of appropriate policies.

Although three separate recommendations could be formulated to address the former problems mentioned (unawareness, lacking insight and an incongruence of interests concerning regional software industries), we argue regional software industries and governments should come together to gain common ground and understanding. Regional roundtable sessions, for instance, could be organized in which representatives from the software industry as well as governments take place. During such sessions, regional software industries are able to demonstrate their economic value and contribution, as well as their needs, challenges and expectations. Governmental representatives, in turn, are then able to indicate their possibilities of supporting regional software industries and communicate their thoughts on the software industry. An example of such roundtable sessions are the ones currently being organized by the Regional Economic Board Utrecht of which the experiences so far have been positive. The long-term effects of such initiatives, however, remain to be seen and analyzed accordingly.

**Recommendation Government 1:** *Organize roundtable sessions (or another format deemed appropriate) in which both representatives from the software industry as well as governments take place. Common ground and mutual understanding can then be gained and harmonization achieved on the needs and challenges facing regional software industries, as well as the capabilities and possibilities of governments to support regional software industries.*

### **7.3.2 Foster Entrepreneurship Within the Region**

It goes without saying that entrepreneurship is an important driver behind economic growth. Software companies and cooperative networks argued that governments should focus on attracting and fostering entrepreneurs within the region (**ICOOP23**; **ICOOP56**; **ICOMP10**). The role of the government herein should not be underestimated, since governmental policy shapes the institutional environment in which entrepreneurial decisions are made (Minniti, 2008). For instance, governmental policies create institutional structures in which some entrepreneurial activities are encouraged, whereas others are discouraged. It can therefore be argued that successful governmental policy is important to successfully attract and foster entrepreneurship and that the

opposite – unsuccessful governing – may cause the contrary: steering entrepreneurs towards actions that have negative impacts on society and the region in which the entrepreneur is located.

One case study participants argued that software companies often remain in the region where the firm was first founded (e.g. **ICOMP56**). Although entrepreneurs could be located in any region thinkable are governments able to attract entrepreneurs by means of, for instance, incubators, manufacturing facilities, low-cost rental space and equipment, bridge funding from regional entrepreneurship funds and guidance through regulations. As a consequence, entrepreneurs are empowered to get their company and products off the ground in a quicker and more successful way, while at the same time energizing the region with positive externalities such as income and job creation. It should be noted, however, that such stimuli provided by governments do not guarantee success, are often disputed and may even backfire (Harrison, Mason, & Girling, 2004; Lerner, 2009). Minniti (2008) provides similar warnings, being that although governments should aim to create an enabling environment for entrepreneurs to thrive, it should do so without too much public involvement and co-interest from the private sector to avoid creating possible market distortions. Audretsch (2004) goes a step further by arguing that governmental intervention should solely be the result of fundamental market failures. Since potential governmental stimuli to attract and foster entrepreneurship are likely to differ between, for instance, a rural, high-technology and metropolitan region, Minniti (2008) and Tödting and Trippel (2005) argue that policy design needs to take into account regional differences in order to create appropriate policies. In other words: there is no ‘one size fits all’ policy program to attract and foster entrepreneurship within a region. Regional governments should therefore individually explore the possibilities with regard to attracting and fostering entrepreneurs.

**Recommendation Government 2:** *Regional governments should explore the possibility and conditions of attracting and fostering entrepreneurs within their region without too much public involvement and co-interest from the private sector to avoid creating possible market distortions.*

### 7.3.3 Competition Among Regions

Case study participants indicated to witness “*pointless competition among regions, hampering not just the development of our own regional software industry but the development of the domestic software industry in its entirety*” (**ICOOP29; ICOOP30; IGOV15; IGOV28**). Regional cooperative networks argued that regional partnering between governments when it comes to creating and executing policies could yield benefits such as specialization and resulting complementarity effects. Despite these perceived advantages, did one cooperative networks argue that governments are often engaged in “*an everlasting contest where every region aims to be victorious over their peers [...] Instead of collaborating to achieve networking effects and a more powerful industry overall, both municipalities want to emerge as the sole victor.*” (**ICOOP30**). Governmental representatives confirm this view and argue that aldermen – responsible for creating and executing policies – are judged based on the performance of their own municipality and not the performance of others (**IGOV14; IGOV15; IGOV27; IGOV28**). As one governmental representative indicated: “*From a municipal perspective, the aldermen and his colleagues have the assignment to strengthen the position of their*

*own region. [...] So you can imagine that these people have a very inward-looking perspective when it comes to regional collaboration.” (IGOV15).*

In summary, governmental representatives interviewed acknowledged that expanding cooperation between municipalities may yield significant benefits for all stakeholders involved, that these benefits are recognized and that the willingness to partner is most definitely present. However, municipalities are ‘deadlocked’ (i.e. a situation in which no advancement is possible) due to aldermen being responsible for the (financial) results of their own municipality and not the results of other municipalities. Despite aiming for specialization and complementarity between regions, do municipalities have a ‘the winner takes it all’ mentality. The latter is considered by cooperative networks and governmental representatives themselves as wasted opportunities, but can be clarified and justified from a political point of view. A solution proposed by governmental representatives is to scale up territories from a political perspective to eliminate needless competition, thereby effectively causing a region to be governed as a whole rather than multiple territories competing with each other. The latter solution, however, would require a restructuring of the political landscape in the Netherlands which is an unthinkable objective. Instead, municipalities are encouraged to explore the possibilities of cooperating with other municipalities, while at the same time communicating the rationale and reasons to partner to their electorate to avoid being rebuked.

**Recommendation Government 3:** *Explore the potential benefits of regional cooperation among peer municipalities by looking for specialization and complementarities between regions rather than engaging in rivalry. Communicate the intentions of regional partnering with stakeholders and the electorate to avoid being rebuked.*

## 8 Discussion

Before concluding this research project, we first provide a reflection on this research project to discuss weaknesses, threats to validity and future research opportunities. Multiple research methods were utilized while carrying out this research project. The first subsection discusses the focused literature review and its influences on the research project. The second subsection addresses threats to validity concerning the case study participant selection method and the case study interviews conducted. The third subsection, in turn, discusses the survey with particular emphasis on the data collection phase and formulated recommendations. Finally, the fourth subsection provides avenues for future research.

### 8.1 Focused Literature Review

A focused literature review was conducted to acquire prerequisite knowledge on the topics of economic geography and regional economics. This gave insight in how and in what way economic actors (e.g. software companies, educational institutions and governments) organize themselves in regions with resulting consequences, to understand and clarify manifestations of said consequences, and to understand spatial organizations of economic activities within regions. In addition, an understanding of the current state of the Dutch product software industry was obtained by studying findings presented in existing literature. In summary, the focused literature review provided a solid basis upon which the theoretical foundation of this research is built. An example of the latter is the regional innovation system model as described by Tödting and Tripl (2005). Studying findings presented in existing literature to uncover the current state of the Dutch product software industry, however, was an arduous task. The primary problem encountered when looking at statistics available on the Dutch product software industry, is that **no specific category for product software companies exists**. Although software producing organizations in general are grouped under SBI 6201 (a classification number) in the database of Statistics Netherlands (Centraal Bureau voor de Statistiek, 2013), do product software companies not have a separate category with data available. The lack of such data was a setback for this research project and hampers the Dutch product software industry in demonstrating its size and importance in the Dutch economic landscape, which is now solely based on rough estimates (Te Velde et al., 2010).

### 8.2 Case Study Interviews

Multiple case study interviews with different stakeholders in regional software ecosystems were conducted as a second research method. These interviews were conducted to uncover the perception of software companies, cooperative networks and governmental representatives regarding the role the government fulfills at this moment, and could fulfill to support regional software ecosystems. In addition, perceived benefits and drawbacks of partnering with research and educational institutions and businesses among each other were also studied. One validity threat of the case study interviews is that **although the case study participants unanimously agreed upon various subjects discussed, case study participants also had entirely different attitudes and**

**opinions on other subjects discussed.** This difference in attitude and opinion became not just apparent while comparing regions as a whole, but also among actors within the regional ecosystems studied. For instance, whereas company A in region X may have positive experiences with regard to regional partnering with other software companies, may company B indicate to not be interested in regional partnering at all (e.g. because of highly specialized software produced). The **limited amount of case studies conducted per region** threatens external validity and therefore limits us to draw definitive and overarching conclusions on how to support the Dutch product software industry as a whole. Contrary to performing a top-down analysis as performed in this research project, could a **bottom-up analysis** reveal deeper insights into a regional ecosystem. As such, the structure of a regional innovation system can be mapped and visualized from within, rather than from above. An appropriate group of companies to be studied could be formed, from where (e.g. by means of interviews) other software companies could then be identified – similar to the snowballing effect. During a research evaluation meeting with academics and experts, it was expected that approximately 80-90% of a regional ecosystem can be identified when third grade contacts (known companies of known companies of the initial group of companies selected) of the initial group of companies has been approached and interviewed. The drawback of this bottom-up approach, however, is that it demands significantly more effort and is time-consuming.

### 8.3 Survey

The third research method utilized was a survey with the aim of covering as many Dutch product software companies as possible (primarily due to its aim of taking stock of the industry). The survey was validated and evaluated through multiple initiatives, among which were a steering committee consisting of academics and experts, multiple review and evaluation sessions with academics from Aalto University (Finland) and the Technical University of Darmstadt (Germany), test sessions to make the survey fool-proof to reduce misunderstanding and ambiguity and expert reviews. In addition, multiple initiatives were undertaken to promote the survey among software companies to reach out to as many potential case study participants as possible. Examples of such initiatives were an official announcement during the first Dutch Product Software Conference on 19 March 2013 in Zeist, data mining contact details to invite as many eligible software companies as possible, press coverage, promotion via the cooperative networks interviewed and postings in LinkedIn groups. Despite all efforts to enhance the rigidity and popularity of the survey, **the amount of responses is considered to be low (N=20)**, in particular when taking the stock-taking nature of the survey into account. The low amount of responses out of several potential thousands of product software companies located within the Netherlands severely threatens the reliability and external validity of the research findings and the hereupon formulated recommendations.

The low amount of responses has been thoroughly discussed and analyzed to discover what mistakes were made and what could have been done better. No issues concerning the rigidity of the survey were identified after multiple review sessions with (international) academics and experts, with the exception of one question being marked as redundant. However, many problem factors were identified concerning the logistical aspects surrounding the distribution and promotion of the survey. First, **no comprehensive contact database was available to approach a large share of the Dutch**

**product software industry.** Contrary to initial expectations, did we not have access to the contact database utilized during the preceding research project (see Te Velde et al. (2010)) due to privacy-related concerns. As a consequence, a new contact database had to be created based on manual data mining procedures. The latter was an arduous task since apart from several websites containing information about Dutch software products and their producers (e.g. <http://www.softwaregids.nl/>, <http://www.softwarepaketten.nl/>) no repositories of software company contact details exist that are freely accessible. Second, **the research project lacked support on a higher level** (e.g. Nederland ICT) to obtain a greater coverage area in terms of potential survey participants. Orchestrating the survey in collaboration with such trade organizations may spark increasing interest in the survey and provide access to additional communication channels. A third issue identified was the **difficulty of delivering the survey invitations to the right people at the right place**. Either a board member or a dedicated partner manager had fill out the survey due to the strong emphasis on organizational characteristics, strategic aspects and partnering in general. Getting in contact with software companies was a challenge on its own, and getting the survey to the right person was an even more difficult task. Finally, contrary to the preceding research project (Te Velde et al., 2010), did this research project **not have funding to its disposal** to initiate e.g. marketing activities to promote the survey. Such a budget could also have been used to acquire contact details of potential survey participants that are possessed and maintained by specialized companies.

#### 8.4 Future Research

By zooming in on regional aspects of collaboration between software companies, research and educational institutions and governments, we have gained a better understanding of the needs, challenges, dynamics and structure of regional software ecosystems. However, the relatively low amount of responses to the survey (N=20) was deemed insufficient to perform valid and meaningful cross-regional analyses. The latter is considered to be a missed opportunity, since performing cross-regional analyses is expected to provide insight in best practices and success stories that are applicable to any regional software ecosystem despite their inherent differences. An obvious avenue of future research would be to **organize this survey again on a greater scale, with official support from influential stakeholders** such as trade organizations and governments themselves. It should be noted that the latter would be a tremendous effort, however, especially due to the remaining issue of lacking contact details of potential survey participants.

In case it is decided to carry out the survey once more with broader support from influential stakeholders, **data gathered from a large amount of software companies should be aggregated on a regional level**. Similarities and differences between regions can then be identified and translated accordingly into best practices and recommendations. Furthermore, the data gathered from survey participants can then also be used to **benchmark the Dutch product software industry with other countries in which the same or a similar survey is organized** (e.g. Germany, Finland and Austria).

In case the recommendations presented in this thesis will be realized in practice, progress will have to be monitored accordingly on whether or not the recommendations are deemed effective. Since most recommendations demand long-term commitments from multiple stakeholders, is a

**longitudinal study required to monitor the progress of carrying out selected recommendations and to assess their impacts on regional software ecosystems.** The results of such monitoring and analyses efforts could then lead to additional or refined recommendations on how to improve the overall health and performance of regional software ecosystems.

As already discussed in the preceding subsection 8.2, can a **bottom-up case study approach contrary to a top-down approach** provide valuable insights in how regional software ecosystems are structured. By analyzing regional software ecosystems from within, more fine-grained results are expected that may provide a unique perspective on how actors behave on a micro level. Answers given by research participants can then be cross-analyzed with their direct partners to assess whether companies share a similar opinion on the industry or not.

According to the results of the focused literature review as well as the arguments provided by the case study participants, is the (product) software industry inherently different from other types of industries. Among the reasons given were the intangible nature of software products compared to other types of products (e.g. agricultural products or machinery), the relatively long time it takes to design and develop a software product, and the rapidly changing nature of the industry itself. Considering governmental representatives were unanimous with regard to the enabling role ICT fulfills to let other types of industries thrive. Taking this vital importance of the ICT industry into account, future research should place emphasis on **identifying characteristics of the software industry that set it apart from other types of industries.** This way, recommendations can be provided to create meaningful and effective policy that addresses the needs of the regional software industries, as well as to optimize their pivotal and enabling role to let other types of industries succeed.

## 9 Conclusion

The Dutch software industry is flourishing and plays a valuable role in the Dutch economy. It is an engine of sustainable economic growth, provides tens of thousands of jobs, is a driving force behind innovation and enables other industries to thrive. Despite this success, attention and recognition by the general public is perceived to be lacking. Governments tend to be unaware of the presence of software industries within their region, and cooperation with research and educational institutions on a regional level is often argued to be suboptimal. The regional dimension herein is paramount to get a complete understanding of the regional dynamics at play, and to understand how regional resources – that are unique to every region – shape and contribute to the distinct regional innovative and competitive atmospheres in which software firms operate. Insight into the needs, desires, opportunities and threats regional software ecosystems are confronted with concerning business, educational and governmental partnering, however, remains opaque and deficient. This thesis addressed these shortcomings by means of explorative multi-method empirical research.

A focused literature study was first conducted to discover *why and in what way economic actors organize themselves within regions, and what theories are available to understand and clarify manifestations of such spatial organizations (RQ1)*. Plenty of scientific literature is available that

addresses the benefits and drawbacks of (regional) partnering. Despite a plethora of benefits and drawbacks of regional partnering can be identified, the main conclusion is **that there are no 'one-size-fits-all' policies that can be applied to any type of region in an undifferentiated manner** (Tödtling & Trippel, 2005). The main argument provided is that regions inherently differ from each other in many respects primarily due to differences in intangible assets (e.g. social capital, shared trust and practices) that are of vital importance to turn tangible assets into economic development (Lorenzen, 2007; Rutten & Boekema, 2007). To take these inherent differences among regions into account, **analyzing regions from a regional innovation system perspective was deemed adequate**. A regional innovation system has its focus on the firms, public organizations (research and educational organizations), and institutions (regional policymakers and social capital) present within a region, including interdependencies between actors (i.e. software companies and their competitors, collaborators, contractors and customers) within regions and to higher scope levels (e.g. the national innovation system, other regional innovation systems or the European Union). This perspective was utilized throughout this research project to analyze regions and interpret the results accordingly.

Second, *findings presented in existing literature tell us little about the current state of the Dutch product software industry (RQ2)*. **Industry performance monitors are scarce and existing (regional) databases containing information that although useful on an abstract level** (e.g. company size and amount of employees), **severely lack data richness in order to gain accurate insight in regional software industries**. The deficiency of databases containing information deemed appropriate was also found to be the main contributing factor to the issue of limited 'findability': case study participants indicated to have little knowledge of where peer software companies are located and what expertise they offer. As such, the benefits to engage in regional partnering remain opaque.

Third, *the annual Finnish software industry* (<http://www.softwareindustrysurvey.org/>) *was examined to distill a common set of questions that eventually were included in a new survey aimed at the Dutch product software industry that was created during this research project (RQ3)*. The Finnish software industry is the longest running software industry survey in the world with its 15<sup>th</sup> anniversary just celebrated in 2012. To date, the data resulting from the Finnish software industry survey has proven to be a reliable, valuable and continuous source to support researchers and practitioners in drawing conclusions about the industry. In addition, it offers insight into what kind of actions have to be undertaken or what governmental policies have to be created or adapted accordingly. Drawing upon this success, a similar survey was created and conducted between March and July 2013 and had the aim of taking stock of the Dutch product software industry while at the same time obtaining insight into regional partnering from a broader perspective. Despite multiple initiatives to promote the survey, however, the number of responses is regarded to be low (n=20) – in particular when taking the stock-taking nature of the survey into account. Despite the low number of responses threatening the reliability and external validity of the research findings, interesting **high-level patterns could be distilled from the dataset**. For instance, **respondents indicated to aim at strong growth in international markets**, argued that **the government within their region is insufficiently aware of the presence of the software industry within their region**, and that **maintaining relationships with higher education institutions and universities within the region of the respondents is considered to be important if not essential**.

Fourth, *multiple case studies were conducted with different stakeholders in the Dutch product software industry in three different regions to gauge the sentiment concerning regional business, educational and governmental partnering.* The first set of case studies were conducted with software companies and cooperative networks (RQ4), followed by a second set of case studies with governmental representatives (RQ5). Results of the case studies conducted with software companies and cooperative networks reveal that the awareness of both software companies and governments on regional industrial activity and perceived benefits of partnering within regional software ecosystems is lacking. **The primary issue experienced by software companies and cooperative networks is that it remains largely unknown where potential partners are located and what specific expertise they offer.** As such, insight into regional partnering opportunities is opaque and perceived benefits of regional partnering are considered to be little to none. In addition, software companies and cooperative networks argued that **scaling up regional networking initiatives is required to make a leap forward in terms of professionalization, to make the software industry a more appealing partner for external parties** (e.g. governments or investors) to do business with. Furthermore, although relationships with research and educational institution were indicated to be of great importance, **communication with both types of stakeholders often occurs in an ad-hoc and reactive manner.** The latter was frequently cited to cause incongruences of interests, among which is a lack of graduates in general, as well as a major gap between theory taught at educational institutions and the skills demanded in practice. Finally, software companies and cooperative networks argued that **governments within their region tend to be unaware of the presence of software industries within their region and that governments tend to not recognize the value software industries offer.** The same holds for the sentiment that **regional policymakers do not understand the economics of the software industry, that accomplishing anything with regional governments tends to be an uneasy task, and that regional governments engage in pointless competition among regions** that hamper not just the development of regional software industries within their own respect, but the development of the domestic software industry in its entirety.

The second set of case studies conducted with governmental representatives in specific regions was oriented at distilling governmental perspectives on supporting regional software industries (RQ5). Governmental representatives were also asked about their vision on in which direction regional governments should be heading in the future, and what the software industry could do to more effectively engage with regional governments. According to the governmental representatives interviewed, **the software industry lacks a unified voice by which it should clearly communicate its needs and challenges.** Regional governments consider the feedback stemming from the software industry to be fragmented. Furthermore, governmental representatives argued to not acknowledge all of the criticism provided by software companies and cooperative networks on regional governments. For instance, governmental representatives argued that **policymakers are responsible for shaping an appropriate business climate in which software companies can most optimally conduct their business.** As such, software companies should not expect civil servants or policymakers to have in-depth knowledge about the software industry or the economic mechanisms driving the industry, nor do regional governments feel responsible to fix all the problems experienced by regional software industries (e.g. a lack of graduates). In summary, **the software industry and governmental representatives have different perspectives on the role regional governments could play to support or interact with the software industry.**

Despite the incongruences of interests and conflicting perspectives, however, a willingness by all stakeholders to intensify regional partnering activities (including governmental relations) is signaled. **All stakeholders are found to be willing to address and discuss the identified issues inhibiting effective regional partnering, and have the desire to act accordingly.** To resolve these identified issues, the sixth objective of this research project was to *formulate recommendations based on the results of the case studies and the survey, with the aim of improving the current state of regional business, educational and governmental partnering as well as to improve the overall health of the Dutch product software industry (RQ6)*. The recommendations provided are provided from a regional innovation system perspective, implying that each recommendation appeals to a specific subsystem (e.g. software companies belonging to the knowledge application and exploitation subsystem, educational institutions belonging to the knowledge generation and diffusion subsystem, and regional policymakers and external forces). To tackle the lacking insight into regional industrial activity, all stakeholders are encouraged to identify, **visualize and map the presence of software companies located within their region including their expertise offered**. Regional competences are hereby identified, leading to increased awareness of software companies of regional partnering opportunities. The same holds for identifying complementary industries and customers to which software companies located within the region could sell their software to or develop software for, to spark regional specialization and economic value creation. To achieve a greater extent of professionalization in terms of increased speaking volume and influence, software companies are encouraged to **explore the possibility of scaling up regional business networking activities**. This will result in increased attractiveness to governments, entrepreneurs and other external parties such as international investors. Related to the former recommendations, is the creation of a long-term vision on where the Dutch product software industry should be heading. Product software trade organizations such as Nederland ICT should **create a long-term roadmap stating the right of existence of the Dutch product software industry, the major challenges and opportunities expected, and what influence the Dutch product software industry has on the national economy**.

From the perspective of the knowledge generation and diffusion system that includes public research organizations and educational institutions, all stakeholders in the software industry are recommended to **intensify industrial-educational relationships**. First, **roundtable sessions could be organized in which representatives from software companies and educational institutions take place**. As a result, an attempt is made to harmonize the needs and demands of both software companies and educational institutions (e.g. to bridge the gap between theory taught at universities and skills demanded in practice). Second, it is recommended to **establish dedicated communication channels between software companies and educational institutions** to achieve and maintain consistency in relationships between software companies and educational institutions – an enabler for effective communication to take place. Third, to address the sub optimal flow of graduates every year, **figureheads of the Dutch software industry could come together to demonstrate the attractiveness of studies relevant to the domain of the software industry such as informatics and information science**. Such dedicated campaigns will spark interest and attract more students to opt for a career in the software industry.

Finally, recommendations are also provided oriented at regional policymakers at regional governments and other relevant external parties (e.g. other regional innovation systems). First, to tackle the lacking awareness and insight of civil servants in the software industry and to resolve incongruences of interests, it is recommended to **organize roundtable sessions** (or another format deemed appropriate) **in which both representatives from the software industry as well as governments take place**. Common ground and mutual understanding can then be gained and harmonization achieved on the needs and challenges facing regional software industries, as well as the capabilities and possibilities of governments to support regional software industries. Second, software companies and cooperative networks emphasized the role regional governments could play to foster entrepreneurship within regions. Entrepreneurship is considered to be an important driver behind economic growth and dynamism is therefore requested to be stimulated. As such, **regional governments are recommended to explore the possibility and conditions of attracting and fostering entrepreneurs within their region**. This should be done, however, without too much public involvement and co-interest from the private sector to avoid creating possible market distortions. Third and finally, case study participants were unanimous with regard to pointless competition occurring among regions on a governmental level that hampers not just the development of regional software industries themselves, but the development of the domestic software industry in its entirety. Governmental representatives argued that although the willingness to partner between regions is most definitely present, municipalities are ‘deadlocked’ due to aldermen being responsible for the (financial) results of their own municipality and not for the results of other municipalities. As a consequence, municipalities tend to have a ‘the winner takes it all’ mentality, leading to unnecessary and damaging behavior that is in no one’s interest. Regional governments are recommended to **explore the potential benefits of regional cooperation among peer municipalities, by looking for specialization and complementarities between regions, rather than engaging in rivalry**. Intentions of regional partnering should first and foremost be made clear and communicated to stakeholders involved and the electorate, to avoid being rebuked.

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## Appendix

### Appendix A – Case Study Protocol

The following case study protocol is based on a case study protocol template provided by Brereton et al. (2008). Minor adaptations to the template have been made to tailor it to this research project. References are provided in the tables below to where the content or answers to the respective protocol questions can be found.

| <b>1. Background</b>   |                                       |
|--|---------------------------------------|
| a) Identify the previous research on the topic                       | See Sect. 4 – Theoretical Background  |
| b) Define the main research question being addressed by this study   | See Sect. 2 – Research Questions      |
| c) Identify any additional research questions that will be addressed | See Sect 2.1 – Sub Research Questions |

| <b>2. Design</b>   |   |
|--|---|
| a) Identify whether single-case or multiple-case and embedded or holistic designs will be used, and show the logical links between these and the research questions. | See Sect. 3.2 – Empirical Studies   |
| b) Describe the object of study (regional software ecosystems and constituents)  | For short description of object of study: see Sect. 3 – Research Approach<br>For elaborate description and definitions of object of study: see Sect. 4 – Theoretical Background |
| c) Identify and propositions or sub-questions derived from each research question and the measures to be used to investigate the propositions                        | For sub-research questions: see Sect. 2.1 – Sub Research Questions<br>For measures to be used: see Sect. 3 – Research Approach  |

| <b>3. Case Selection</b>       |   |
|--------------------------------|---|
| a) Criteria for case selection | See Sect. 3.2.1 – Case Study Selection Criteria |

| <b>4. Case Study Procedures and Roles</b>    |                            |
|--|----------------------------|
| a) Procedures governing field procedures     | N/A (no field procedures)  |
| b) Roles of case study research team members | N/A (only one team member) |

| <b>5. Data Collection</b>             |   |
|---------------------------------------|---|
| a) Identify the data to be collected  | See Sect. 3.2.3 – Survey Creation and Data Collection |
| b) Define a data collection plan      | See Sect. 3.2.3 – Survey Creation and Data Collection |
| c) Define how the data will be stored | See Sect. 3.2.3 – Survey Creation and Data Collection |

| <b>6. Analysis</b>   |   |
|--|---|
| a) Identify the criteria for interpreting case study findings  | OK, cf. Yin (2003) – Fig. 2.3: Case Study Tactics for Four Design Tests   |
| b) Identify which data elements are used to address which research question / sub question / proposition and how the data elements will be combined to answer the question | See Sect. 2 for overview of RQs<br>Sub-RQ1: foc. lit. review, peer-reviewed sources<br>Sub-RQ2: foc. lit. review, governmental reports<br>Sub-RQ3: review Finnish software survey 2012<br>Sub-RQ4: case studies w/ firms & coop networks<br>Sub-RQ5: case studies w/ governmental reps.<br>Sub-RQ6: case studies / survey / foc. lit. reviews |
| c) Consider the range of possible outcomes and identify alternative explanations of the outcomes, and identify any information that is needed to distinguish between these | Taken into account during analysis.   |
| d) The analysis should take place as the case study task progresses  | Done.   |

| <b>7. Plan Validity</b>  |                                       |
|--|---------------------------------------|
| a) General: check plan against the checklist items of Runeson and Höst (2009) for the design and the data collection plan  | Done, see Appendix G.                 |
| b) Construct validity: show that the correct operational measures are planned for the concepts being studied. Tactics for ensuring this include using multiple sources of evidence, establishing chains of evidence, expert reviews of draft protocols and reports | For construct validity: see Sect. 3.5 |
| c) Internal validity: show a causal relationship between outcomes and intervention/treatment   | For internal validity: see Sect. 3.5  |
| d) External validity: identify the domain to which study findings can be generalized. Tactics include theory for single-case studies and multiple-case studies to investigate outcomes in different contexts.  | For external validity: see Sect. 3.5  |

| <b>8. Study Limitations</b>  |                          |
|--|--------------------------|
| a) Specify residual validity issues including potential conflicts of interest (i.e. that are inherent in the problem, rather than arising from the plan) | See Sect. 8 – Discussion |

| <b>9. Reporting</b>   |   |
|---|---|
| a) Identify target audience, relationship to larger studies (Yin, 2003) | See Sect. 1 – Introduction & Sect. 4 – Theoretical Background |

| <b>10. Schedule</b>  |  |
|--|--|
| a) Give time estimates for all the major steps: Planning, Data Collection, Data Analysis, Reporting. | See initial planning/proposal document (omitted from this thesis due to no added value). |

| <b>11. Appendices</b>   |  |
|---|--|
| a) Validation: report results of checking plan against checklist items of Runeson and Höst (2009) | See Appendix G.  |
| b) Divergences: update while conducting the study by noting any divergences from the above steps  | Updates and adjustments are performed on the fly and are not registered. Changes made to protocols including an explanation for these changes are reported in Sect. 3 (Research Approach). |

## Appendix B – Activity Table

**Table 24: Activity table of the process-deliverable diagram**

| Activity                                 | Sub-Activity   | Description   |
|--|--|---|
| Preparation                              | Identify research opportunities                        | An identification of research opportunities within this domain of research was performed to formulate a PROBLEM STATEMENT.  |
|  | Formulate research questions                           | Based on the PROBLEM STATEMENT, multiple RESEARCH QUESTIONS were formulated that drive this research project.   |
| Focused literature studies               | Study literature on the state of the software industry | Getting to know the context in and for which the research is performed is evidently paramount. This concerned a study of the current STATE OF THE SOFTWARE INDUSTRY LITERATURE in the Netherlands.  |
|  | Study literature on economic geography                 | In order to understand and be able to clarify manifestations of regional ecosystems (clusters) of actors within regions on different scope levels, innovation systems, and drivers behind spatial clustering, a focused study on ECONOMIC GEOGRAPHY LITERATURE was performed.   |
|  | Study literature on evolutionary economics             | A focused study on EVOLUTIONARY ECONOMICS LITERATURE was required to understand and clarify actions undertaken by actors within ecosystems on various scope levels (micro, meso and macro).   |
|  | Write theoretical background                           | The reports of the focused literature studies were used as input for a THEORETICAL BACKGROUND, that presents an overview of the findings addressed in scientific literature that constitutes the foundation of this research.   |
| Analyze Finnish software industry survey |  | The Finnish software industry survey (2012) was analyzed in order to distill a common set of generic SURVEY QUESTIONS that also apply to Dutch product software companies. The result of this analysis was a PRELIMINARY SOFTWARE INDUSTRY SURVEY, solely containing generic questions about e.g. delivery model(s), business model(s), type(s) of products offered, growth expectancies, and so forth. |
| Case studies                             | Formulate selection criteria                           | Selection criteria were formulated to ensure candidate case study participants are representative for the domestic software industry, yet at the same time being as diverse as possible to enhance reliability and external validity of the outcome of this research. This resulted in a LIST OF CASE STUDY CRITERIA.   |
|  | Identify case study candidates                         | CASE STUDY CANDIDATEs were identified based on the LIST OF CASE STUDY CRITERIA.   |
|  | Select case study participants                         | A representative set of CASE STUDY PARTICIPANTs was composed b/o the LIST OF CASE STUDY SELECTION CRITERIA.   |

|         |  |  |
|---------|--|--|
|         | Write interview protocols  | An INTERVIEW PROTOCOL in which all necessary research steps and measures are predefined was created and tailored to the CASE STUDY PARTICIPANTS, to ensure a similar approach when conducting each individual case study.  |
|         | Study available documentation about case study participants          | Available documentation about the CASE STUDY PARTICIPANTS was studied to gather additional background information, leading to increased 'common ground'.   |
|         | Conduct case study interviews  | Case studies were conducted with the CASE STUDY PARTICIPANTS, and INTERVIEW TRANSCRIPTIONS were made where necessary and stored in a CASE STUDY DATABASE.  |
|         | Interpret case studies   | The results of the case studies were then interpreted, leading to a CASE STUDY REPORT.   |
| Survey  | Combine and analyze results from literature studies and case studies | A DATA ANALYSIS REPORT was written by combining and analyzing the results of the literature studies and the case studies stored in the CASE STUDY DATABASE.  |
|         | Formulate non-generic survey questions                               | Based on the DATA ANALYSIS REPORT, multiple non-generic SURVEY QUESTIONS were formulated, contrary to the generic survey questions defined in the PRELIMINARY SOFTWARE INDUSTRY SURVEY.  |
|         | Create draft survey  | The SURVEY QUESTIONS, including the PRELIMINARY SOFTWARE INDUSTRY SURVEY version, resulted in a SOFTWARE INDUSTRY DRAFT SURVEY.  |
|         | Evaluate draft survey  | The SOFTWARE INDUSTRY DRAFT SURVEY was evaluated by academics and experts, and led to an EVALUATION REPORT.  |
|         | Finalize survey  | The SOFTWARE INDUSTRY DRAFT SURVEY was modified according to the EVALUATION REPORT, thereby creating a SOFTWARE INDUSTRY FINAL SURVEY that met all the aforementioned criteria and addressed all issues in the EVALUATION REPORT.  |
|         | Conduct survey   | After the SOFTWARE INDUSTRY FINAL SURVEY was finalized, it was sent to a selected group of participants. These participants had a timeframe of approximately two weeks to fill out the survey. The results of the survey led to the construction of a SURVEY RESULTS DATABASE. |
| Closure | Analyze survey results   | Based on the aforementioned SURVEY RESULTS DATABASE, concrete RECOMMENDATIONS were formulated after having analyzed the survey results.  |
|         | Write report   | RECOMMENDATIONS concerning how support for regional software ecosystems can be improved were communicated to all stakeholders of this research project by means of an ADVISORY REPORT.   |

## Appendix C – Concept Table

**Table 25: Concept table of the process-deliverable diagram**

| Concept                                   | Description   |
|---|---|
| PROBLEM STATEMENT                         | A PROBLEM STATEMENT contains the necessary contextual information to understand why the research is performed (Tracy, 2007).  |
| RESEARCH QUESTION                         | A RESEARCH QUESTION concisely conveys what a researchers will be looking for and address, as well as specify the purposes of a study (Yin, 2003).   |
| STATE OF THE SOFTWARE INDUSTRY LITERATURE | STATE OF THE SOFTWARE INDUSTRY LITERATURE encompasses all knowledge gained from the focused literature on the topic of the current state of the Dutch software industry, and is a component of the THEORETICAL BACKGROUND.              |
| ECONOMIC GEOGRAPHY LITERATURE             | ECONOMIC GEOGRAPHY LITERATURE encompasses all knowledge gained from the focused literature study on the topic of economic geography, and is a component of the THEORETICAL BACKGROUND.  |
| EVOLUTIONARY ECONOMICS LITERATURE         | EVOLUTIONARY ECONOMICS LITERATURE encompasses all knowledge gained from the focused literature study on the topic of evolutionary economics, and is a component of the THEORETICAL BACKGROUND.  |
| THEORETICAL BACKGROUND                    | A THEORETICAL BACKGROUND consists of concepts, definitions, explanations and theories found in published literature that are relevant and contribute to understanding the research topic and context.                                   |
| PRELIMINARY SOFTWARE INDUSTRY SURVEY      | A PRELIMINARY SOFTWARE INDUSTRY SURVEY consists of a set of generic questions derived from analyzing the 2012 Finnish software industry survey, that are also applicable to the Dutch product software industry.                        |
| LIST OF CASE STUDY SELECTION CRITERIA     | A LIST OF CASE STUDY CRITERIA contains a set of criteria potential CASE STUDY PARTICIPANTS have to adhere to, in order to enhance various types of validity (Yin, 2003).  |
| CASE STUDY CANDIDATE                      | A CASE STUDY CANDIDATE is any entity (person, organization or network) that satisfies the LIST OF CASE STUDY CRITERIA and could be a potential CASE STUDY PARTICIPANT (Yin, 2003).  |
| CASE STUDY PARTICIPANT                    | A single CASE STUDY PARTICIPANT or an array of CASE STUDY CANDIDATES must be chosen that will participate in the research, based on the list of identified CASE STUDY CANDIDATES (Yin, 2003).   |
| INTERVIEW PROTOCOL                        | An INTERVIEW PROTOCOL contains questions that serves as a path we suggest respondents to take, to address elements that are key to the research project and are important to provide answers to the RESEARCH QUESTION(s) (Dilley, 2000) |
| DOCUMENT STUDY                            | A DOCUMENT STUDY is performed to gather additional background information about the CASE STUDY PARTICIPANTS (Yin, 2003).  |
| INTERVIEW TRANSCRIPTION                   | An INTERVIEW TRANSCRIPTION is the result of turning an audio file into a written transcript.  |

|                                |   |
|--------------------------------|---|
| CASE STUDY DATABASE            | A CASE STUDY DATABASE contains all relevant data that has been gathered from the conducted case studies.  |
| CASE STUDY REPORT              | A CASE STUDY REPORT summarizes the findings from the conducted case studies, that were stored in a CASE STUDY DATABASE.   |
| DATA ANALYSIS REPORT           | A DATA ANALYSIS REPORT combines and analyzes results of the focused literature studies (STATE OF THE SOFTWARE INDUSTRY LITERATURE, ECONOMIC GEOGRAPHY LITERATURE, and EVOLUTIONARY ECONOMICS LITERATURE), as well as the results from the case studies stored in a CASE STUDY DATABASE. |
| SURVEY QUESTION                | A SURVEY QUESTION aims to produce reliable and valid answers to one or multiple RESEARCH QUESTIONS (Fowler, 1995).  |
| SOFTWARE INDUSTRY DRAFT SURVEY | A SOFTWARE INDUSTRY DRAFT SURVEY is a composition of generic SURVEY QUESTIONS based on the PRELIMINARY SOFTWARE INDUSTRY SURVEY as well as multiple non-generic SURVEY QUESTIONS based on the focused literature studies and case studies.  |
| EVALUATION REPORT              | An EVALUATION REPORT contains the strengths and weaknesses formulated as a result of an evaluation by both academics and experts.   |
| SOFTWARE INDUSTRY FINAL SURVEY | A SOFTWARE INDUSTRY FINAL SURVEY is the final product after having adapted the SOFTWARE INDUSTRY DRAFT SURVEY based on feedback as formulated in the EVALUATION REPORT.   |
| SURVEY RESULTS DATABASE        | A SURVEY RESULTS DATABASE contains the results of the SOFTWARE INDUSTRY FINAL SURVEY held among a selected group of participants.   |
| RECOMMENDATION                 | A RECOMMENDATION is a course of action that is advised to one or multiple stakeholders in this research project.  |
| ADVISORY REPORT                | An ADVISORY REPORT contains all RECOMMENDATIONS on how support for regional software ecosystems can be improved, and is presented to all stakeholders of this research project. It is the final deliverable of this research project.   |

## Appendix D – Interview Protocol Cooperative Networks

### Personal Introduction (interviewer)

- Give a short personal introduction about interviewer and Utrecht University.
- Explain scope of the research project
- Ask for permission to record the interview. The recordings will be deleted as soon as the research project is considered to be finished.
- We will make sure that all data gathered during this interview will be made anonymous.

### Introduction Participant / Organization

- 1 Could you please give a short introduction about [name of the cooperative network]?
  - a. For what reasons was the network founded, what was its initial aim?
  - b. In what year was the network founded?
  - c. On what terrains (type of participants, name region) does the network have its focus?
  - d. Has the network always had its focus on the same scope level?
- 2 Could you please give a short introduction about yourself?
  - a. How did you get to work for [name network]?
- 3 How many members does [name network] have?
  - a. Are only ICT companies a member of your network, or are other kinds of organizations welcome too?
  - b. In case other types of company are welcome to be a member of your network, what is the reason behind this? What is the added value of including other types of organizations to be a member of your network?
- 4 What kind of ICT companies are a member of your network? For instance, do they solely produce software, or are there also members whose main focus is offering consultancy services or hardware vendors?
- 5 Do all software companies that are a member of your network solely offer software products, or do they also carry out tailor-made software projects, embedded software, etc?
- 6 What are the reasons for interested companies to become a member of [name network]?
- 7 Is [name network] still growing in terms of the number of members it has?
- 8 What kind of activities are being conducted here at [name network]?
  - a. Could you please provide any examples of regular activities? For instance organizing networking events, facilitating the establishment of partnerships, etc?
- 9 Do you consider [name network] to be successful?
  - a. Does the network achieve the goals which it initially, when it was founded, had to address?

- b. Could you please provide any examples of recent initiatives that turned out to be successful?

## Main Content

- 10 What do you think of the current state of the software industry in your region?
  - a. Does it flourish, stagnate or is it stable?
  - b. Can this growth/stagnation/stability be attributed to e.g. the financial crisis, the quality of the regional labor market, the culture, ...?
- 11 Do software companies within your region cooperate, and to what extent does this occur?
  - a. What are reasons for companies to cooperate?
  - b. Could you provide any examples of partnerships being established between software companies in this region?
  - c. How formalized are these partnerships? Primarily informal, or contractually defined?
- 12 What is the role of [name network] to facilitate cooperation between members?
  - a. Do you only facilitate the exchange of knowledge between members (e.g. staff pools, employee exchanges), or also on a technical level (joint development, purchasing licenses)?
- 13 What is the role of [name network] concerning the knowledge infrastructure within the region (posting vacancies or internships, inviting professors to give a talk, actively engage in research projects)?
  - a. How would you rate the cooperation between software companies and research and educational institutions within this region?
  - b. Are there any points of improvements you can think of?
- 14 What is your opinion about the current role the regional government fulfills to support the local software industry?
  - a. Is the government sufficiently or insufficiently aware of the presence of the software industry within this region?
  - b. In what ways does the regional government remain informed about the status of the regional software industry? Does the government play an active or passive role with regard to communication from or to the industry, e.g. to communicate interests, needs and challenges?
  - c. Could you provide any examples of initiatives that the government currently offers or accepts from the industry, to support the software industry within the region?
  - d. Should the government play an active role to support the software industry, or should it operate in the background? Should the government play any role at all?
- 15 What could the regional government do to improve the current situation concerning governmental support?
  - a. Do you think the regional government does its job well, or does it fail to do so?
- 16 What are software companies within your region most in need of when it comes to governmental support from both a regional as well as national perspective?

- a. Do software companies prefer direct influence (e.g. subsidies, networking opportunities, etc.) or indirect influence (e.g. stimulating research by shaping an appropriate legal environment, influencing the labor market, etc.)?
- 17 Does knowledge or any other form of exchange take place between [name network] and other cooperative networks or similar organizations located in other regions?  
a. Could you please provide any examples?
- 18 What do you consider to be the cornerstones / causes of the success / decay of this region? Examples include geographical aspects such as universities located nearby, or non-physical aspects such as culture, norms and values?  
a. Is this region unique in comparison with other regions in the Netherlands?  
b. Do you consider this to be an advantage or disadvantage?
- 19 What (additional) challenges do you expect to see in the future?  
a. More influence related to the European Union?  
b. Increased cooperation between companies because of international competition / costs?
- 20 Are there specific points of improvement concerning governmental support?
- 21 What could cooperative networks do to improve their current role to support the software industry?
- 22 What could software companies themselves do to improve the overall health of the software industry?
- 23 What advice do you have for companies who would like to most optimally benefit from everything regional partnering has to offer?
- 24 Do you notice differences between the opinion of the national government and the regional government?
- 25 To conclude: if you had to judge the regional government with respect to the role it fulfills to support the regional software industry, would you rate this as excellent, sufficient, or insufficient?

### Round Up

- Thank the interviewee for his or her time and for taking part in the interview.
- Explain what will happen with the data stemming from the interview.
- Explain the next steps in the research project.
- Ask the interviewee whether he or she would like to be informed about further developments of the research project.
- Exchange any additional contact details.

## Appendix E – Interview Protocol Product Software Companies

### Personal Introduction (interviewer)

- Give a short personal introduction about interviewer and Utrecht University.
- Explain scope of the research project
- Ask for permission to record the interview. The recordings will be deleted as soon as the research project is considered to be finished.
- We will make sure that all data gathered during this interview will be made anonymous.

### Introduction Participant / Organization

- 1 Could you please provide a short introduction about your company / the company you work for?
  - a. What kind of software products are developed at [name company]?
  - b. Do you also offer / deliver any non-mass-production related services such as consultancy or tailor-made software?
  - c. In what domains is [name company] active? What kind of customers do you serve?
  - d. In what year was [name company] founded?
  - e. On what geographical scale does [name company] do business (regional, national, international)?
  - f. How many employees does [name company] have?
- 2 Could you please provide a short introduction about yourself?
  - a. What is your role within [name company] and what are your responsibilities?
  - b. For how many years have you been working for [name company]?

### Regional Aspects

- 3 Is [name company] active within the region?
  - a. Does [name company] take part in regional initiatives?
  - b. Could you mention any examples of regional activities in which [name company] took part, or made possible (e.g. networking events, regional joint ventures, etc.)?
  - c. Is [name company] a member of a cooperative network or anything similar?
- 4 What do you think of the current state of the software industry in your region?
  - a. Does it flourish, stagnate or is it stable?
  - b. Can this growth/stagnation/stability be attributed to e.g. the financial crisis, the quality of the regional labor market, the culture, ...?
- 5 What do you consider to be the cornerstones / causes of the success / decay of this region? Examples include geographical aspects such as universities located nearby, or non-physical aspects such as culture, norms and values?
  - a. Is this region unique in comparison with other regions in the Netherlands?
  - b. Do you consider this to be an advantage or disadvantage?
- 6 Do software companies within your region cooperate, and to what extent does this occur?
  - a. What are reasons for companies to cooperate?

- b. Could you provide any examples of partnerships being established between software companies in this region?
- c. How formalized are these partnerships? Primarily informal, or contractually defined?
- d. In case organization partners within the region: is this deemed successful / beneficial? In case organization does not partner within the region: does [name company] not cooperate with other firms on purpose, or are you interested in exploring the opportunities of regional partnering?
- e. What are obstacles hampering effective partnering between software companies? What are possible solutions to overcome such obstacles?
- f. Do you see any added value of regional partnerships that are of a technical nature, such as regional development ventures, exchanging software components, etc.?
- g. What is the best way to cooperate with other software companies? Does [name company] have any specific strategy in place?
- h. How do you get to know other software companies within the region?

## Regional Government

- 7 What is your opinion about the current role the regional government fulfills to support the local software industry?
  - a. Is the government sufficiently or insufficiently aware of the presence of the software industry within this region?
  - b. In what ways does the regional government remain informed about the status of the regional software industry? Does the government play an active or passive role with regard to communication from or to the industry, e.g. to communicate interests, needs and challenges?
  - c. Does the government fulfill an active role, a passive role (in which information is retrieved from external parties such as your organization or cooperative networks), or are they not interested in the regional software industry at all?
  - d. Could you provide any examples of initiatives that the government currently offers or accepts from the industry, to support the software industry within the region?
  - e. Should the government play an active role to support the software industry, or should it operate in the background? Should the government play any role at all?
  - f. Would an intermediary work out as a communicator between the regional software industry and the regional government?
- 8 **[Question asked to companies located in the Utrecht region]:** have you heard of the establishment of an organization named the Regional Economic Board Utrecht?
  - a. In case yes: do you support this initiative?
  - b. Do you think the Regional Economic Board Utrecht will become a success story? What factors contribute to this anticipated success or failure?
- 9 What could the regional government do to improve the current situation concerning governmental support?
  - a. Do you think the regional government does its job well, or does it fail to do so?
- 10 What could software companies themselves do to improve the overall health of the software industry?

- 11 What is your company (and other software companies located within the region) most interested in / in need of concerning support from the regional government and the national government?
- Do you favor direct governmental involvement (e.g. subsidies (WBSO), networking events), or indirect influence (e.g. shaping a proper entrepreneurial climate, exert influence over the labor market, provide an appropriate legal environment)?

### Regional Educational Partnering

- 12 Do you attach value to educational institutions (e.g. higher educational institutions, universities) located within the region?
- Could you characterize this/these relationship(s) you maintain with educational institutions, if any? Are these relationships managed in a proactive or reactive manner?
  - Could you provide any examples of initiatives between your company and educational institutions (e.g. offer internships, inviting guest speakers, engage in mutually beneficial research projects)?
  - Is there an optimal partnership between software companies and educational institutions within the region? What factors contribute to this success or failure?
  - Could you provide any concrete points of improvement concerning partnership relationships with educational institutions and vice versa?
  - How could these recommendations be realized?

### Other Questions

- 13 What (additional) challenges do you expect to see in the future?
- More influence related to the European Union?
  - Increased cooperation between companies because of international competition / costs?
- 14 Do you notice differences between the opinion of the national government and the regional government?
- 15 To conclude: if you had to judge the regional government with respect to the role it fulfills to support the regional software industry, would you rate this as excellent, sufficient, or insufficient?

### Round Up

- Thank the interviewee for his or her time and for taking part in the interview.
- Explain what will happen with the data stemming from the interview.
- Explain the next steps in the research project.
- Ask the interviewee whether he or she would like to be informed about further developments of the research project.
- Exchange any additional contact details.

## Appendix F – Interview Protocol Governmental Representatives

### Personal Introduction (interviewer)

- Give a short personal introduction about interviewer and Utrecht University.
- Explain scope of the research project
- Ask for permission to record the interview. The recordings will be deleted as soon as the research project is considered to be finished.
- We will make sure that all data gathered during this interview will be made anonymous.

### Introduction Participant / Organization

- 1 Could you please provide a short introduction about [name of governmental organization]?
  - a. In what year was [governmental organization] established?
  - b. What were the reasons for [governmental organization] to be established?
  - c. What role does the ICT sector play within the work / activities conducted by [governmental organization]?
  - d. What are the goals of [governmental organization]?
  - e. What parties are involved in [governmental organization] (e.g. governments, companies, educational institutions)?
  - f. How many people are working for [governmental organization]?
- 2 Could you please provide a short introduction about yourself?
  - a. What is your role within [governmental organization]?
  - b. What are your responsibilities as [role] within [governmental organization]?

### Main Content

- 3 Is the provincial government or the municipality of [name municipality] aware of the presence of the regional ICT industry?
- 4 How does the government view the ICT sector from an economics perspective?
  - a. Does the government deem the ICT sector to be of added value, or of to be of little importance?
- 5 How is the regional ICT sector being rated in comparison with other sectors, when it comes to economic policy?
  - a. Does the regional ICT sector deserve a prominent place in the regional economic policy of [name municipality/province]? Why or why not?
  - b. Does the vision of [name municipality/province] align with that of the national government?
- 6 Does the [name municipality] possess sufficient knowledge about the ICT sector, to be able to formulate and execute adequate regional economic policy?
- 7 How does [name municipality] remain informed of recent developments and the needs of the regional ICT sector?
  - a. What resources/tools are used to remain informed?
  - b. Does this occur in a proactive or reactive manner?
- 8 Are other regional stakeholders in the software industry (e.g. software companies or research and educational institutions) actively engaged when formulating regional economic policy?
  - a. In what way does this occur?

- b. Is this deemed effective, or what could be done to improve the involvement of other stakeholders?
- 9 Does [name municipality] communicate its plans with other regions outside of [name municipality]'s territory?
  - a. Are economic policies being tuned / adjusted to achieve complementarity or more effectively achieve goals?
- 10 What possibilities does [name municipality/organization] see to support prominent regional sectors (such as the regional ICT sector)?
  - a. Could you provide any examples (e.g. offer interest-free financial capital, facilitating knowledge infrastructures, facilitating technical infrastructures, serve as launching customer)?
  - b. Does [name municipality] maintain an open attitude with regard to welcoming input from regional sectors such as the ICT sector?
- 11 How does communication occur between regional ICT sector and the regional government?
  - a. Are there dedicated communication channels in place, such as dedicated civil servants or account managers?
  - b. Does [name municipality] routinely organize e.g. roundtable sessions to discuss the needs and issues of the regional ICT sector and vice versa?
- 12 Does [name municipality/organization] see any direct points of improvement when it comes to tuning / adjusting regional economic policy with the needs of regional business sectors such as the ICT sector?
  - a. What could the ICT sector do to more effectively / constructively approach the regional government?
  - b. What could [name municipality] do to more effectively /constructively approach the regional ICT sector?
- 13 Do you have anything else to add about regional economic policy or the regional ICT sector that hitherto has not been subject of discussion?

### Round Up

- Thank the interviewee for his or her time and for taking part in the interview.
- Explain what will happen with the data stemming from the interview.
- Explain the next steps in the research project.
- Ask the interviewee whether he or she would like to be informed about further developments of the research project.
- Exchange any additional contact details.

## Appendix G – Results of Case Study Protocol Assessment

The following case study protocol checklist by Runeson and Höst (2009) has been utilized to assess the case study protocol to enhance its validity.

| <b>Case Study Design</b>  |   |
|---|---|
| 1. What is the object of study?   | Governmental support for regional software ecosystems   |
| 2. Is a clear purpose/objective/research question /hypothesis/proposition defined upfront?                                | Yes – See Sect. 2: Research Questions   |
| 3. Is the theoretical basis - relation to existing literature and other cases - defined?                                  | Yes – See Sect. 4: Theoretical Background   |
| 4. Are the authors' intentions with the research made clear?  | Yes – See Sect. 1: Introduction   |
| 5. Is the case adequately defined (size, domain, process...?)   | Yes – See Sect. 3: Research Approach  |
| 6. Is a cause-effect relation under study? If yes, is the cause distinguished from other factors?                         | Both explorative and causal.  |
| 7. Will data be collected from multiple sources? Using multiple methods?  | Yes – focused literature reviews, multiple case studies with three different types of sources, and a large scale survey   |
| 8. Is there a rationale behind the selection of roles, artifacts, viewpoints, etc.?                                       | Yes – it has been made sure that selected case study participants are representative for the entire industry, while at the same time being as diverse as possible to ensure both reliability and external validity. |
| 9. Are the case study settings relevant to validly address for the research question?                                     | No  |
| 10. Is the integrity of individuals/organizations taken into account?   | Yes – by repeating essential questions at different times and in different ways   |
| <b>Preparation for Data Collection</b>  |   |
| 11. Is a protocol for data collection and analysis derived (what, why, how)?  | Yes – See Appendix A.   |
| 12. Are multiple data sources and collection methods planned?   | Yes – focused literature reviews, multiple case studies with three different types of sources, and a large scale survey   |
| 13. For quantitative data, are the measurements well defined?   | Case studies: N/A (qualitative)<br>Survey: OK (quantitative). Extensively reviewed.   |
| 14. Are the planned methods and measurements sufficient to fulfill the objective of the study?                            | Yes, reviewed in cooperation with various academics and practitioners.  |
| 15. Is the study design approved by a review board, and has informed consent obtained from individuals and organizations? | Yes. Study design is approved by the Software~VOC, multiple academics, supervisors and practitioners.   |
| <b>Collecting Evidence</b>  |   |
| 16. Are data collected according to the protocol?   | Yes, both the case studies and the survey.  |
| 17. Is the observed phenomenon correctly implemented (e.g. to what extent is a design                                     | N/A   |

|  |   |
|--|---|
| method under study actually used)?   |   |
| 18. Are data recorded to enable further analysis?                                | Yes. Case study interviews were recorded (and transcribed where necessary). In addition, the results of the survey are stored in a separate database. |
| 19. Are sensitive results identified (for individuals, organization or project)? | Yes. Done in cooperation with participants. All data has been made anonymous.   |
| 20. Are the data collection procedures well traceable?                           | Yes. Everything is documented and described in Sect. 3 (Research Approach).   |
| 21. Do the collected data provide ability to address the research question?      | Yes. See Sect. 3 (Research Approach) and following sections (e.g. Results and Analysis).  |

| <b>Analysis of Collected Data</b>   |   |
|---|---|
| 22. Is the analysis methodology defined, including roles and review procedures?                                 | N/A – solo effort. Results and analysis are reviewed by a ‘steering committee’.   |
| 23. Is a chain of evidence shown with traceable inferences from data to research questions and existing theory? | Case study results from the interviews can be traced back to notes, transcriptions and recordings. Survey results can be traced back to the database. |
| 24. Are alternative perspectives and explanations used in the analysis?   | Yes – case study interviews (qualitative) and survey results (quantitative) and expert reviews (performed by both academics and practitioners).       |
| 25. Is a cause-effect relation under study? If yes, is the cause distinguished from other factors?              | Partially. Some questions aim to prove a cause and effect, others attempt to find cause and effect relationships.                                     |
| 26. Are there clear conclusions from the analysis, including recommendations for practice/further research?     | Yes. Formulated in Sect. 7 and a separate document communicated to the research participants.   |
| 27. Are threats to validity addressed in a systematic way?  | Yes – see Sect. 3.5 (Validity) and Sect. 8 (Discussion).  |

| <b>Reporting</b>  |  |
|---|--|
| 28. Are the case and its context adequately reported?                           | Yes – see Sect. 5 (Case Study Results) and Sect. 6 (Survey Results).                       |
| 29. Are the research questions and corresponding answers reported?              | Yes – both in Sect. 7 (Analysis) and Sect. 9 (Conclusion).                                 |
| 30. Are related theory, hypotheses and propositions clearly reported?           | Related theory has been reported in Sect. 4 (Related Literature). No hypotheses were made. |
| 31. Are the data collection procedures presented, with relevant motivation?     | Yes – see Sect. 3 (Research Approach) for an extensive documentation.                      |
| 32. Are sufficient raw data presented?  | Yes – see Sect. 5 (Case Study Results) and Sect. 6 (Survey Results).                       |
| 33. Are the analysis procedures clearly reported?                               | Yes – see Sect. 3 (Research Approach) for an elaborate description.                        |
| 34. Are threats to validity analyses reported?                                  | Yes – see Sect. 3.5 (Validity) and Sect. 9 (Discussion).                                   |
| 35. Are ethical issues reported openly (personal intentions, integrity issues)? | N/A.   |

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| 36. Does the report contain conclusions, implications for practice and future research? | Yes – see Sect. 7 (Analysis) and Sect. 8 (Discussion) and Sect. 9 (Conclusion).                              |
| 37. Does the report give a realistic and credible impression?                           | Yes – reviewed by both academics and practitioners.  |
| 38. Is the report suitable for its audience, easy to read and well structured?          | Yes – tailored to audience and reviewed by both academics and practitioners, including ‘steering committee’. |

## Appendix H - Overview of Quotation Identifiers and Quotations

Table 26: Overview of quotation identifiers used for interviews conducted with cooperative networks

| Identifier | Quotation   |
|------------|---|
| ICOOP1     | The <b>primary goal of CoopFoodValley</b> is “to stimulate collaboration and knowledge exchange in the Food Valley by connecting ICT companies, research and educational institutions, companies with an interest in ICT, and those working in the ICT industry.”   |
| ICOOP2     | I experience <b>the mentality and work ethic of the people living and working here to be different than in other parts of the Netherlands</b> . They are eager to work, even during weekends when we experience busy times. People here seem to be more involved with the company they work for.”   |
| ICOOP3     | The Food Valley region has “a great plurality of companies that sparks collaboration and interaction, contrary to regions such as Utrecht where a small amount of monolithic companies dominate the landscape. [...] This <b>plurality comes with labor mobility and the exchange of knowledge, contributing to economic development</b> .”   |
| ICOOP4     | “you can get from A to B relatively quick here due to our <b>central location</b> in the Netherlands and excellent road and railway connections. We also see an increasing influx from (people living in, red.) German towns just across the border with whom our municipality maintains excellent ties.”   |
| ICOOP5     | “ <b>They do not see the benefits of it</b> (to examine the presence of peer companies, red.). <b>Performing their day-to-day business activities is their top priority</b> , and demands nearly all of a company’s efforts. [...] Besides, what would be the effort of partnering in the software industry be, aside from knowledge exchange? Companies in the agricultural sector could share expensive machines. But software companies? There is an abundance of skilled and relatively cheap self-employed people who are available upon request!” |
| ICOOP6     | “In many cases, <b>our regional ICT industry delivers a great amount of complementary goods and services to agricultural firms present within the Food Valley</b> . Here you can see an interesting <b>self-reinforcing cycle</b> going on, being that the better the match between the goods and services delivered by ICT companies, the greater the amount of investments will be in the future due to increased success of their customers.”  |
| ICOOP7     | “the <b>increasing influence from the European Union</b> could be seen as an opportunity. It presents companies with more opportunities, for instance to sell their software or provide consultancy services in other member states. However, we have to be careful since <b>scaling up business activities often does not go without risks</b> .”  |
| ICOOP8     | “ <b>contact with the government occurs in an ad-hoc manner</b> .”  |
| ICOOP9     | “The government pays attention to our industry and has an <b>open attitude</b> when it comes to communicating interests. <b>Common ground, however, is frequently lacking</b> . [...] Companies and governments are never singing from the same hymn-sheet.”  |
| ICOOP10    | “Governmental representatives rarely have knowledge about our industry and our activities and therefore do not understand the challenges ICT companies within our region experience. On the other hand, however, I notice that companies care little about  |

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|         | <p>interaction with the government and their desires. This results in an <b>incongruence of interests</b>. [...] There is a light-year distance between the intentions of an alderman and a company”.</p>   |
| ICOOP11 | <p>“that is impossible to solve. I am confident that <b>even initiatives that enjoy widespread support such as the Regional Economic Board in Utrecht</b> (aiming to bring industries and the government closer together, red.) <b>will fail in the long run</b>. Influential people such as directors will most likely be present during the first one or two meetings. Afterwards, they will send low-level representatives since they want to see immediate results that often take a long time to be noticeable.”</p>   |
| ICOOP12 | <p>“(regional governments should, red.) <b>facilitate more</b>. Take good care of the technical infrastructure such as installing a future-proof fiberglass network.”</p>   |
| ICOOP13 | <p>“The government operates in an inward-looking manner. <b>There are no civil servants who are able to understand the needs of the industry and translate that into concrete opportunities for which the government could provide assistance</b>. It is unrealistic to assume this can be changed.”</p>  |
| ICOOP14 | <p>“Centralization tends to be more efficient due to increased working power, although decentralization is more effective. Decentralized government has more insight in local needs and has direct vision on the playing field, although this is paired with increased costs. The national government should therefore be cautious and weigh up the pros and cons when it comes to decentralization and deregulation. It is hard to tell which variant would be the most optimal. Probably <b>a combination</b> (of centralization and decentralization, red.) <b>would be the best option to mitigate the associated risks</b>.”</p> |
| ICOOP15 | <p>“<b>there is a need for well-educated employees</b> – even when speaking of less specialized functions such as system administrators. ICT companies and educational institutions are therefore working on a joint initiative to offer associate degree programs to students who would like to both increase their chances on the labor market, while at the same time addressing the deficiencies experienced by ICT companies.”</p>   |
| ICOOP16 | <p>“<b>membership leads to two distinct categories</b>: those who are members and those who are not. I want any company to be able to approach me, not just a select group of companies. As a result, I also have unrestricted movement as for what I both can and want to do.”</p>   |
| ICOOP17 | <p>“bring companies in contact with each other on a management level. In the past, <b>we used to have no idea who was located where and what expertise was offered by those parties</b>. We still experience this as a problem, although we gain insight through networking events and activities.”</p>   |
| ICOOP18 | <p>“<b>The quality of a product or service is strongly favored over the geographical proximity</b> of a potential partner when it comes to collaboration. Besides, the Netherlands is rather small in size. Whether a potential partner is located in Utrecht or Groningen, it matters little.”</p>   |
| ICOOP19 | <p>“When you work in a high-tech sector such as the biomedical industry where research facilities are expensive, it makes sense to collaborate in order to reduce costs and at the same time benefit from mutually applicable expertise. <b>In the software industry, however, this is almost non-existent</b>.”</p>  |

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| ICOOP20 | <i>"organizing events such as workshops, seminars, roundtable discussions and master classes."</i>  |
| ICOOP21 | <i>"Due to the open and accessible nature of the network, companies more easily approach us to get a taste of what it is like".</i>   |
| ICOOP22 | <i>"When the latter is known and companies become acquainted, the ball usually starts rolling. First you get to know each other, then you learn to trust each other, then the time comes to do business. <b>Findability of companies is still a big issue</b>, however, even after 11 years when CoopUtrecht was founded! [...] If we ourselves as an industry have no idea where we are and what we do, it is not unthinkable that the government experiences even greater problems than we do when it comes to having insight in our industry".</i>   |
| ICOOP23 | <i>"since the Netherlands is a rather small country, <b>regional governments should focus on attracting and retaining entrepreneurs in the earliest phases of their development to make them stay in the long run</b>. If companies are looking for e.g. skilled employees or a stimulating and dynamic environment, they won't hesitate to move to another region. It is therefore, in my opinion, paramount to prevent such companies from moving away."</i>  |
| ICOOP24 | <i>"the Task Force Innovatie Regio Utrecht (an organization that highlights innovation in branches of industry that currently gain limited attention, and aims to help innovative sectors to achieve further growth, red.) just <b>did not want to recognize the presence of IT in our economic landscape</b>."</i>   |
| ICOOP25 | <i>"They just have <b>absolutely no clue what our regional economy looks like</b>".</i>   |
| ICOOP26 | <i>"When TNO (Netherlands Organization for Applied Scientific Research, red.) performed an investigation (ordered by the Regional Economic Board Utrecht, red.) to gain insight into our regional economic landscape, <b>an undisputed conclusion was that our IT sector was of utmost importance when it comes to regional job creation and economic contribution</b>." [...] <i>"Research showed that the value of our IT industry was indeed not recognized. Apparently, our industry is not sexy enough compared to life sciences and design. The government has a hard time figuring out what we actually do."</i></i> |
| ICOOP27 | <i>"Apparently the government doesn't just lack interest in our industry. They also have to cope with <b>ignorance and inexperience</b>. It is mission impossible to find someone out of all the approximately 700 civil servants working for our province who possesses knowledge about our industry. The same holds for the Chamber of Commerce."</i>   |
| ICOOP28 | <i>"<b>look for alternatives where government and the industry do not have to directly deal with one another</b>. Perhaps the Regional Economic Board Utrecht will show some initial successes, but I expect this success will be limited to individual projects. You do have to start somewhere, however."</i>   |
| ICOOP29 | <i>"the <b>competition for similar industries</b> between regions that is utmost pointless."</i>  |
| ICOOP30 | <i>"<b>an everlasting contest where every region aims to be victorious over their peers</b>. The municipalities of Utrecht and Amersfoort both enjoy the presence of a thriving gaming industry. However, <b>instead of collaborating to achieve networking effects and a more powerful industry overall, both municipalities want to emerge as the sole victor</b>."</i>   |
| ICOOP31 | <i>"When you look at the <b>Brainport Eindhoven region</b>, everyone agrees that the regional economic policy carried out is working out wonderful."</i>  |
| ICOOP32 | <i>"<b>relative uniformity of the industry in that region</b>. The Brainport region is a cluster of</i>   |

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|         | <p>high-tech companies such as ASML, NXP and Philips. Apparently the government goes all-in on those high-tech clusters, which results in an unparalleled success. On the other hand, a more diverse industry such as ours in <b>Utrecht has the advantage of being shock-resistant</b>. When one type of industry experiences a downturn, other industries may still flourish.”</p>  |
| ICOOP33 | <p>“should <b>never rely on regional governments</b> to assist them, nor to undertake action. However, <b>it most definitely is part of the responsibility of regional governments to look after industries present within their region.</b>”</p>   |
| ICOOP34 | <p>“exactly what the current problem is all about. <b>They have no knowledge and do not understand our industry, nor do they possess the capability to effectively communicate with us to see how our industry can be supported and improved.</b>”</p>  |
| ICOOP35 | <p>“Stop wasting time on time-consuming activities. Instead, <b>venture into the region and see what our industry is like and then determine how it can be improved</b>. It will be an eye-opener!”</p>   |
| ICOOP36 | <p>“<b>geographical proximity plays no role</b> when you have been educated in Utrecht, and get offered a job you like in Amsterdam. In fact, it is not even necessary to move.”</p>  |
| ICOOP37 | <p>“the real <b>strength of this region lies in its central location</b> within the Netherlands”.</p>   |
| ICOOP38 | <p>“deplorable [...] It always comes down to companies blaming universities, and universities blaming companies. There exists no synergy between these two worlds. To make things more ironic, governments often shout from the rooftops that their labor force is among the most well-educated in the world. Although this may be true from a statistical perspective, <b>the skills of recent graduates just do not match with what is needed in the industry.</b>”</p> |
| ICOOP39 | <p>“What we experience is that <b>companies usually first have to educate new employees</b> – who already followed a relevant Bachelor’s or Master’s program – for an additional approximately six years to fully master the skills they need to perform their job well.”</p>   |
| ICOOP40 | <p>“Apparently, <b>the gap between theory and practice is currently too great</b>. We are therefore trying to bridge this gap by coming up with innovative solutions.”</p>  |
| ICOOP41 | <p>“organizing formal and informal events with the purpose of companies getting to (better, red.) know each other from both a geographical perspective (location, red.) as well as the products and services offered (expertise, red.).”</p>  |
| ICOOP42 | <p>“When you look at the economy in Delft, it is clear that our ICT sector is the most prominent. However, <b>nobody has a single clue on who does what, and where to find the expertise present within this region.</b>”</p>   |
| ICOOP43 | <p>“Despite significant efforts, The Hague was unable to find such a company in our region. But we do know it exists. This is just one example to show that <b>we do not utilize our full potential as in industry</b>. [...] First you have to know what (expertise, red.) is located where, and only then can you link actors to each other.”</p>   |
| ICOOP44 | <p>“utilizing data provided by the Chamber of Commerce turned out to be utmost useless. For instance, their records say nothing about for what kind of domain a software development company produces its applications. <b>It is unknown what kind of expertise companies deliver, what the quality is of their goods and services offered, their reputation, and so forth</b>. In other words: the data proved to be too shallow in terms of</p>                         |

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|                | <i>information richness. Again, you want to have an in-depth view and gain insight into who is located where, and what expertise is present at these locations.”</i>   |
| <b>ICOOP45</b> | <i>“We visited successful incubators and large companies, and were able to speak with big investment companies and the local ICT group (Software Developers Forum, red.) to see what we could learn from them. In short, we figured out that the only way to grow and promote collaboration is to <b>increase in scale</b>. Right now, our regional networks such as CoopDelft are run by volunteers. If we were to partner up with the municipalities of Leiden, Zoetermeer, and then to an even greater scale level such as Rotterdam and The Hague, we would make an immense leap forward in terms of professionalization.”</i>   |
| <b>ICOOP46</b> | <i>“After we conducted the trip to Silicon Valley, we jointly wrote a vision document for the government on how to tackle the challenges our industry is facing. But what happened? <b>They did not even pay some serious attention to it</b>. It was basically thrown into the trashcan. This sparked anger in our industry and resulted in the opposite effect of what was hoped to achieve.”</i>  |
| <b>ICOOP47</b> | <i>“have a more liberal attitude! <b>Stop reinventing the wheel countless times over and over again</b>. And please stop this bloody tendering process that is horribly inefficient. If the government would like to support our industry and promote Delft as an ICT-city, my advice would be to go out in the open and talk to knowledgeable people about what could be achieved with the expertise present within your own city. They are always welcome to approach me and ask whether they could exchange some thoughts with influential people on how to better position ICT within our city. We have abundant knowledge on this topic, so why not benefit from it? <b>We have offered our input multiple times, but all attempts were in no avail.</b>”</i> |
| <b>ICOOP48</b> | <i>“If you want to get something done with the government, you truly have to have a long breath and an abundance of patience. <b>It may take well up to several years to get anything done</b>. The ability of the regional government to concentrate shows similarities with that of a toddler. They just can’t stay focused on something they are working on, whereas this focus is demanded from the industry. As such, it actually is a paradox.”</i>  |
| <b>ICOOP49</b> | <i>“If you take a look at the ‘Topsectorenbeleid’ (designated industrial sectors favored over others due to their alleged impact on the economy of the Netherlands, red.) , you will notice that every other random type of industry receives millions of euros to spark innovation. <b>Our ICT industry is never in such a spotlight</b>. For some reason, <b>the local government lacks ambition</b> as well – especially when you realize how many ICT companies are present within this region and the prominence the industry has within the regional economic landscape.”</i>  |
| <b>ICOOP50</b> | <i>“When I look at the creative industry that includes for instance architecture, design and gaming, the collaboration between the industry and the regional government seems to be superb. It is almost surreal. Every person involved seems to be rapturously enthusiastic. Then I ask myself: what do we do wrong? I firmly believe our <b>industry lacks essential communication skills, and so does the regional government</b>. Software is difficult to grasp as it is largely intangible compared with other types of products. Governmental representatives are generally only familiar with using ICT for their own means compared to producing ICT – which is what we do. Next to that, the type of people working in the</i>                           |

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|                | <i>ICT industry are also just less communicative than their peers in other industries. Most of the communication toward and from the government occurs on a personal and individual basis. If you happen to speak with a timid programmer, you can imagine that this makes communication between our industry and the regional government even more difficult."</i>  |
| <b>ICOOP51</b> | <i>"If our ICT industry would like to gain more speaking volume in terms of capacity for action and thrusting power, we should really <b>seek to collaborate on a higher level (greater geographical scale, red.)</b>. As a consequence, we would have more of everything such as manpower and financial capital. This will automatically make our industry a more interesting party to do business with."</i>   |
| <b>ICOOP52</b> | <i>"<b>cross-fertilization of multiple disciplines and stakeholders to spark ideas and economic growth.</b>"</i>   |
| <b>ICOOP53</b> | <i>"We have excellent researchers and educators working at research and educational institutions such as the Delft University of Technology and TNO. Yet we experience it to be an arduous task to get these people out of their offices and have them take a look at what we are doing. [...] We see so many opportunities to collaborate, yet <b>they show little interest</b>. This shows the painful truth that such institutions are and will most likely always remain governmental institutions: there is an <b>absence of pressure to achieve successes</b>, which is the primary goal that companies have."</i> |
| <b>ICOOP54</b> | <i>"Great amounts of financial capital are invested in this region to finance research and educational institutions. The bitter truth is, however, that almost none is allotted to research in ICT. The creative industry and high-tech companies focusing on, for instance, nanomaterial, walk away with all the cash. For some reason, <b>research in ICT just does not seem hot enough for the government</b>. I find this <b>unfair</b>, particularly if you consider the dominant role the ICT industry plays in our regional economy."</i>   |
| <b>ICOOP55</b> | <i>"Many spin-offs are launched from the Delft University of Technology each year. Many companies and other stakeholders are usually willing to support these spin-offs, as they focus on a niche and are therefore interesting. Apart from spin-offs contributing to the dynamism of our region, can they potentially grow to considerable sizes. Since I don't see ICT companies moving from one place to another that quickly, <b>we should foster them and see what the future holds.</b>"</i>   |

**Table 27: Overview of quotation identifiers used for interviews conducted with software companies**

| <b>Identifier</b> | <b>Quotation</b>  |
|-------------------|---|
| <b>ICOMP1</b>     | <i>"Many former Baan employees have started their own company, or were spin-offs back in the day. These companies do some really good business and this is reflected in the growth of our regional software industry."</i>  |
| <b>ICOMP2</b>     | <i>"Most of the large software companies are located to the West of the Netherlands. However, primarily back in the days, many religious people with a reformed background were attracted to Baan. And of course, there were also those who were attracted by the significant successes made by Baan. This group of people settled within this region, resulting in our own tight ICT community with skilled and motivated people."</i> |
| <b>ICOMP3</b>     | <i>"An example of regional partnering would be DynamicsComp <b>hiring people from within</b></i>  |

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|         | <i>the region to fill up a temporary lack of capacity. Sometimes we see a surge in projects. We then need to be able to keep up with the demand, for which temporary workers are excellently suited."</i>  |
| ICOMP4  | <i>"sometimes we also lack domain-specific knowledge to optimally serve a customer. We then look for people who possess the knowledge we need, but these search processes and the areas in which we look are not restricted to our region. <b>We do not care where people come from – as long as they deliver to us the knowledge we need."</b></i>  |
| ICOMP5  | <i>"I can imagine that <b>regional partnering could be of interest to companies that deliver highly-specialized and domain-specific tailor-made software.</b> Of course, we tailor Microsoft Dynamics AX to the demands of our customers in different types of industry. But we do not share any of this knowledge with other software companies. Why would we? In general, I think <b>collaboration among product software companies is rather limited.</b> Put simply, if there are no mutual benefits, we do not cooperate. And such benefits are often very difficult to spot."</i>  |
| ICOMP6  | <i>"I have been working in this industry for about 23 years now and guess what. <b>I have never ever seen someone from the government nor heard of them."</b></i>  |
| ICOMP7  | <i>"I think you really have to take into account that <b>there are no people working for the government who have any knowledge about our industry.</b> I believe this hampers the relationship between the government and our industry."</i>   |
| ICOMP8  | <i>"It will only generate more overhead. Besides, software companies tend to be very specialized in terms of what they do. You cannot be a representative on behalf of the entire regional ICT industry – the situation of every organization is different. This is another <b>complicating factor when communicating with the regional government: the diversity of our industry.</b>"</i>  |
| ICOMP9  | <i>"<b>We do not see any benefits in governmental involvement. Nor do we experience troubles</b> with the regional government."</i>  |
| ICOMP10 | <i>"<b>Governmental support for start-ups and spin-offs would be most welcome.</b> They are usually in need of some assistance when it comes to marketing and financial support. For large and established companies such as DynamicsComp that maintain a healthy financial balance, however, I do not see the benefits of governmental involvement."</i>  |
| ICOMP11 | <i>"... since we do not maintain any relationships with the government, I do not see how the situation could improve. My advice would be to <b>not bother us</b> when conducting our day-to-day activities."</i>   |
| ICOMP12 | <i>"Developments in the ICT industry occur in a rapid manner. People who already work for our company for approximately 15 years or more tend to have a specific mindset towards our customers. We notice that <b>fresh graduates have more appropriate knowledge of recent developments such as social media, apps, and so forth. It is crucial for an organization to stay up to date.</b> In addition, you also have to maintain a healthy salary structure within your organization. We therefore introduced a pyramid model where graduates start at the lowest level, and are then able to climb their way up to the top."</i> |
| ICOMP13 | <i>"<b>interested in taking part in joint initiatives</b> between research and educational institutions [...] We really do see some benefits there."</i>   |
| ICOMP14 | <i>"We maintain a proactive attitude when it comes to <b>providing internships and attracting</b></i>  |

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|         | <i><b>graduates.</b> For any other forms of partnering with regional research and educational institutions, I would argue that we have a rather reactive attitude."</i>  |
| ICOMP15 | <i>"Next to graduates and internships, we are also very much <b>interested in taking part in mutually beneficial research projects.</b>"</i>   |
| ICOMP16 | <i>"First, <b>we have no clue what kind of research is done</b> by universities and higher educational institutions. Second, we would have to appoint one of our employees to proactively manage such relationships."</i>  |
| ICOMP17 | <i>"... an <b>intermediary</b> would be a great solution. [...] In addition, perhaps <b>organizing networking events</b> between universities and the regional ICT industry would be a nice idea. This way, both parties can get to know each other and familiarize themselves with activities conducted in both the research domain and the business domain."</i>   |
| ICOMP18 | <i>"<b>Most companies tend to be different than us.</b> Sometimes you are able to exchange knowledge, but that tends to be some general information."</i>  |
| ICOMP19 | <i>"The insurance business is quite different from other domains. We notice many other software vendors within this region offer either rather simple software products sold in great quantities, or offer products and services related to customer management and marketing activities. We on the other hand deliver a complex business-to-business product to a really small amount of customers. <b>The difference between our company and other companies is just too great.</b>"</i> |
| ICOMP20 | <i>"<b>Most companies knocking on our door tend to be very opportunistic.</b> They would for instance like to aid us in selling our products (rather than exchanging knowledge, red.). In that way, they are much like vultures. We do not seek to collaborate with such companies."</i>   |
| ICOMP21 | <i>"<b>I have no idea on how our industry</b> (from both a national as well as regional perspective, red.) <b>is doing.</b> Now and then I read that the Netherlands maintains a healthy position in the global software market when it comes to product software. I notice some success stories here and there, but apart from that I have no clue. I guess we are doing fine."</i>   |
| ICOMP22 | <i>"... our <b>central position</b> within the Netherlands. This is one of the reasons why we made the decision to start our company in Utrecht: our customers can easily reach us regardless what part of the country they come from. [...] In addition, <b>the amount of companies already located here will also attract other companies.</b> It is always nice to be in the vicinity of other software companies (due to potential networking effects, red.)."</i>                     |
| ICOMP23 | <i>"... <b>the regional government is not aware at all</b> of our presence. [...] I think they have no idea of what we are doing. [...] They do not seem to inform themselves of the status of our industry."</i>  |
| ICOMP24 | <i>"However, <b>I believe our industry does not communicate the status of our industry to the regional government either.</b> When we deal with the regional government, it usually involves some people wanting to check whether our building complies with all the fire safety legislation out there, or how we deal with our garbage."</i>  |
| ICOMP25 | <i>"<b>opportunities are in my opinion limited.</b> They should try to ensure that enough young people are encouraged to study something related to informatics and find a job in our region and industry."</i>  |

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| ICOMP26 | <p>“... (software companies, red.) should <b>not expect miracles</b> to occur through governmental involvement. The regional government should orient itself at <b>facilitating elementary matters</b> such as proper education and legislation. I just do not see why a government that has little knowledge about our industry, would come up with innovation projects to stimulate our industry. The same goes for interconnecting software companies. <b>Just leave it to us.</b> [...] Besides, we have never ever been asked on what kind of role we see fit for the regional government to support our regional software industry. <b>We would then first have to gauge the opinion of the software industry.</b>”</p> |
| ICOMP27 | <p>“I have <b>no clue on what the government could do to support our business.</b> But perhaps if we <b>gauge the opinion of our industry by means of a survey</b>, some interesting results might show up (to which we can act accordingly, red.).”</p>  |
| ICOMP28 | <p>“Almost all of our new employees come from Utrecht University and higher educational institutions located in this region. <b>Maintaining warm ties with these institutions is therefore important</b> to our company. We primarily manage this through <b>study associations</b> and to a little extent through <b>academic personnel.</b>”</p>  |
| ICOMP29 | <p>“<b>I think such initiatives</b> (e.g. guest lectures, red.) <b>are great for both students and companies.</b> Students get to have a taste of what companies they could work for, whereas companies are able to get access to potentially interesting students.”</p>  |
| ICOMP30 | <p>“<b>difficult to get in contact with universities.</b> I can understand this though, since I assume InsuComp is not the only company who would love to get in touch with students. I also understand the burden this places on the shoulders of universities: what companies would and wouldn't they allow in?”</p>  |
| ICOMP31 | <p>“<b>We primarily perform our own research.</b> Either via our own employees or through internships.”</p>   |
| ICOMP32 | <p>“We know complementary knowledge is present at for instance Utrecht University. <b>Learning more about how to effectively develop and manage product software would be most welcome.</b> But for that to occur, you really need to maintain an active relationship that is paired with increased effort. I got sent a stack of papers once. But really, this just does not work out well. <b>You really have to meet up and talk about something in order for effective knowledge exchange to take place.</b>”</p>   |
| ICOMP33 | <p>“We are one of the largest companies within this region. If there are any potential mutual benefits stemming from regional collaboration, <b>firms will approach us and not the other way around.</b> This is one of the advantages you have as a large player. [...] In addition, <b>we also have a history of doing everything ourselves.</b> I notice this trend is changing, however. But specifically placing more emphasis on regional partnering? We honestly <b>do not care where partners come from</b> and therefore do not devote extra time on scanning for regional opportunities.”</p>   |
| ICOMP34 | <p>“I can think of one organization that delivers to us their planning software that we integrate within our own software. I am not entirely sure whether there are more of such examples. However, again I have to say that <b>I assume that such partners have not been specifically chosen because of being located within our vicinity.</b>”</p>  |
| ICOMP35 | <p>“Software is intangible. We can transfer our software to a partner within mere seconds, theoretically speaking. If we would have produced cars, for instance, the situation would</p>  |

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|         | <i>have been different. [...] I think we then would have been located closer to key suppliers or customers. [...] Since we do not have any costs associated with such logistics (in the software industry, red.), I believe regional proximity matters little to none."</i>  |
| ICOMP36 | <i>"We have contact with the regional government with it comes to tax constructions, permits, licenses, and so forth. But apart from that, I believe we do not maintain any formal relationships with the regional government."</i>  |
| ICOMP37 | <i>"Gouda is aware of our industry in a broad sense. But I am unsure to what extent this knowledge leads to any activities or whatsoever."</i>   |
| ICOMP38 | <i>"I am not sure about this, but from what I can tell they tend to be rather reactive. [...] We do have a supplier relationship with (the municipality of, red.) Gouda. This means that you sit around the table every once in a while. But such a municipality and its aldermen, that is a hugely fragmented mess. As such, you do not always have the right person on the telephone when you want to get something done."</i>   |
| ICOMP39 | <i>"an account manager could resolve this issue, to have a dedicated person to whom we can reach out when required. [...] But again, I am not sure whether we have a direct contact line with the regional government. I think we do not".</i>   |
| ICOMP40 | <i>"The municipality of Gouda uses our software with all the associated benefits for us. But I would not call this governmental involvement – they simply cannot purchase the software of every organization here within the region. [...] What would be nice though, is if we would be updated in advance of the roadmap Gouda has when it comes to what they are planning to do within the region. We already hold such talks, but this is more or less to make sure that Gouda, for instance, will not decide to locate a brothel next to our building. Because if that would be the case, then we would be immediately gone here. But again, I would not call this direct involvement in our industry either."</i> |
| ICOMP41 | <i>"not have a clue. I do not immediately see any things I would do to support the software industry. I think the options are really limited. [...] ErpComp makes use of the WBSO (Wet Bevordering Speur- en Ontwikkelingswerk) to acquire R&amp;D tax credits. But we receive such subsidies from our national government – the regional government or Gouda has nothing to do with this."</i>  |
| ICOMP42 | <i>"The software business is a difficult topic to discuss. For instance, the software industry demands long-term investments, it takes quite a long time before you are able to see direct results, it is paired with long-term usage (due to significant investments, red.), and it is intangible and expensive. You know, when compared with the technical infrastructure that can be replaced every three years or so, does software experience great resistance to change (due to the affinity of users to the software, red.). We as an industry are not able to change this overnight. I am not sure why the situation is how it is."</i>  |
| ICOMP43 | <i>"We look at the Rotterdam University of Applied Sciences, The Hague University of Applied Sciences and Utrecht University. Most of the business we do with regional research and educational institutions occurs with these three parties. We have many contacts at these institutions."</i>  |
| ICOMP44 | <i>"In general, as a company, you have to invest significant amounts into such relationships. However, it is sadly the case that this does not happen vice versa. Too little attention is paid to our industry by universities. [...] ErpComp is able to deliver continuity"</i>   |

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|         | <p>when it comes to ideas, wishes and people. But when we look at the contacts we have at Universities of Applied Sciences, we always get to speak with another person (we do not know, red.). As a consequence, there is a <b>lack of common ground and trust</b>. The historical element of the relationship we have with such institutions is absent. [...] Despite we invest in these institutions, it has never really given us an advantage such as a preferred supplier status. I do not expect to receive such benefits per se, but our <b>efforts are not recognized</b>. We find this difficult to understand.”</p>  |
| ICOMP45 | <p>“It is my opinion that universities often place themselves upon a pedestal. There is <b>no trace of complaisance</b> of universities. I find this a real pity.”</p>   |
| ICOMP46 | <p>“ErpComp and other software companies experience the problem that <b>graduates often lack the skills required to do a job well</b>. For instance, too many business informatics students are not able to code a single word and only want to focus on process analysis. As you may understand, this will not work out.”</p>   |
| ICOMP47 | <p>“would therefore <b>appreciate to have speaking volume in the curricula offered by universities</b>.”</p>   |
| ICOMP48 | <p>“We would be really <b>interested to closely work together with other companies and universities to bring forth new courses</b>. [...] We are able to deliver part of the expertise required. [...] We could even arrange a range of guest lecturers that match the contents and learning outcomes of such new courses. [...] I think this is a great idea, and I am sure other companies will think the same about this.”</p>  |
| ICOMP49 | <p>“<b>continuity is of utmost importance</b> in a relationship. Sure, we are usually able to get in contact with someone at a university who is responsible for partner management. However, it is our experience that these people switch jobs at a rapid pace. [...] From our side, we aim to deliver this continuity. Sadly this is does not occur the other way around. Every single time we have to communicate who we are, what we do, what we have achieved, and what we would like to achieve in the future. After six years, I wonder: do they still have no clue?” [...] If Utrecht University for instance would pay more attention to us, we are very much willing to return the favor. [...] It is also very <b>difficult to plan ahead in time</b>. For instance, ErpComp was tremendously enthusiastic about the software product management course taught at Utrecht University. But what happened? The lecturer left for another university and the course is scrapped from the curriculum and the knowledge is gone. We experience this as a real handicap. [...] Again, all of this could be resolved by continuity (so we know what is going on and what will happen in the future, red.).”</p> |
| ICOMP50 | <p>“<b>more frequent contact with universities and that the same responsible people should be involved</b>. [...] To make this process more efficient, <b>scaling up such contacts with other companies could be an idea</b>. [...] Again, we do not have to see immediate results. But <b>at least provide continuity</b> that would solve most of the problems we experience.”</p>   |
| ICOMP51 | <p>“<b>We do not partner at all</b> with other companies within the region. Not even with Utrecht University. [...] Neither are we a member of a cooperative network (such as CoopUtrecht, red.).”</p>   |
| ICOMP52 | <p>“the Dutch product software industry is an enormous industry. I think it is <b>enormously underestimated</b>. It should also <b>seek to professionalize itself</b>. There are a lot of product</p>  |

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|         | <p>software companies out there who are trying to reinvent the wheel themselves, and I see them (unnecessarily, red.) suffer greatly in doing so.”</p>  |
| ICOMP53 | <p>“I find <b>the Utrecht region a services epicenter</b>. Perhaps that says enough. I do not see it flourish. You will notice that it is the services industry that is currently facing tremendous pressure. <b>The product software industry has a challenge that can be tackled</b> (challenges related to e.g. changing business and delivery models, red.), <b>but the services industry</b> (that generally follows in the footsteps of the product software industry, red.) <b>has to reinvent itself</b>. And when I look around me, I primarily see companies that offer services. [...] And these are the companies whose business models and value adding activities are being debated. Honestly, I find it difficult to make an adequate judgment.”</p> |
| ICOMP54 | <p>“Most product software vendors once started out as tailor-made software producers. However, as more and more customer projects are being carried out and processes get automated, a shift toward productization can often be witnessed. As such <b>I find it quite reasonable that software vendors are located within the vicinity of their clients.</b>”</p>   |
| ICOMP55 | <p>“I think that <b>collaboration is not geographically bounded in any way</b>. [...] I do know that one of our sister companies named [x] that produces embedded software, really thinks in terms of regions. They are for instance located in the region Eindhoven, a location deliberately chosen to be within the vicinity of their customers such as ASML and Philips. This has nothing to do with the proximity of universities or any other companies or institutions.”</p>  |
| ICOMP56 | <p>“There is also another perspective that I have, being start-ups coming forth from universities. Some of these start-ups will become successful and <b>will remain located within the region where they were initially founded</b>. I think Delft is successful with this, that has attracted many start-ups that eventually became rather large companies. I do not see such things occur in Utrecht. Perhaps I fail to see it, or if that it is just not present. [...] But again, if you see what beautiful and mature businesses can arise from start-ups, <b>I think it would be greatly beneficial to regional economies to keep them within the region.</b>”</p>   |
| ICOMP57 | <p>“our <b>central position</b> within the Netherlands. We are here because every traffic jam leads to Utrecht. That is the advantage of our region.”</p>   |
| ICOMP58 | <p>“I think this (educational institutions being located nearby, red.) is not important in the Netherlands. [...] Look, our sister company Pink Roccade has the greatest share of their team working in Apeldoorn and another company is located near Den Bosch. They don’t take universities into account. And why would they? [...] The Netherlands rather small anyway, and I assume <b>graduates do not care to spend some more time traveling if they can find the job of their dreams in any random city</b> (where that employer would be located, red.)”</p>  |
| ICOMP59 | <p>“There are people who say that it is strange that the software industry is not marked as a top sector (referring to the Topsectorenbeleid, red.)” [...] I think that <b>the software industry does not yet deserve such a status</b>. Because honestly, <b>although our industry is fairly large compared with other industries, we do not generate any mindboggling export figures</b>. [...] <b>It would be a more interesting sector if the export numbers would show an increase</b>. Because right now, export-wise we do not do that much.”</p>  |

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| ICOMP60 | <p><i>"The Dutch product software industry produces quite a lot of software aimed at vertical markets – we excel in this. But vertical markets often come with their own specific laws and regulations that are specific for the Dutch market. Some software companies therefore solely have the Netherlands as their market."</i></p>  |
| ICOMP61 | <p><i>"the hospital ICT industry (in the Netherlands, red.) is substantially different from other countries in the world. It is obvious that this makes it difficult to export such products tailored to our own legislation. [...] On the other hand, everything is organized in a rather good way in the Netherlands. Other countries are still busy formulating legislation for which the Netherlands serves as one of the model countries. [...] I think this is a brilliant export proposition (to deliver a total solution, red.). [...] I think <b>the government could do a lot more to stimulate these processes</b> (and attract attention from other countries, red.)."</i></p>  |
| ICOMP62 | <p><i>"The big problem in our market [...] is the mediocre flow of students graduating from universities. The <b>lack of focus within curricula</b> is also a problem. When I go to Romania, I can find many students who know everything about software architecture. But here in the Netherlands? [...] Perhaps <b>the government could aid our industry in steering this in the right direction</b> (for instance by means of media campaigns to attract more students specialized in ICT students, red.)."</i></p>  |
| ICOMP63 | <p><i>"I believe that <b>the government is not there to solve the problems of our industry</b>. [...] I think <b>our industry and the Netherlands as whole lacks a long-term vision</b>. We should ask ourselves: what is the our right to exist? Then we should find out to what extent ICT is able to contribute to our right of existence, then translate this to the needs coming from our industry, and then look for solutions to counter these problems. We have lots of <b>legacy and immaturity within our industry</b>. The <b>lack of graduates</b> is not the only problem, but also the <b>inflexibility in our labor market</b> and the <b>mediocre innovation climate</b> within our country. These three are related to each other. This is <b>partly caused by the government</b>, so we will have to look for a solution to solve this."</i></p>  |
| ICOMP64 | <p><i>"<b>obviously important</b>. But I think that if Sjaak Brinkkemper would have been located in Eindhoven instead of Utrecht, this would have made no difference to me and I would still have reached out to him. [...] The <b>location of such institutions is therefore irrelevant</b> to me."</i></p>  |
| ICOMP65 | <p><i>"We are primarily <b>interested in research</b>. But from a [name company of interviewee] perspective, we are <b>in need of graduates</b>."</i></p>   |
| ICOMP66 | <p><i>"I think that <b>universities should be both better informed and inform themselves on the needs of our industry</b>. I also think that <b>our industry should take more responsibility in doing so</b>. [...] I think the greatest shortage our industry is currently dealing with, is the <b>lack of well-educated software engineering graduates</b>. However, we are also in great need of business engineers who can think from both a functional and a business perspective. With this I mean product managers. [...] This is not just my personal experience at InnovComp. I truly see this all around me in the entire ICT industry. [...] <b>Universities should therefore not skew their policy to either of these sides</b> (since more emphasis on software engineering will lead to a decrease in the amount of business engineers, and vice versa, red.). [...] In summary, <b>the bottleneck in our industry is a</b></i></p> |

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|         | <p><b>strong lack of graduates</b> who are able to translate business needs from customers into technical solutions offered by software companies.”</p>  |
| ICOMP67 | <p>“I think Nyenrode is a perfect example of good collaboration between industrial sectors and a university. [...] They do two things. First, they <b>connect the industry with their university</b>. The industry is able to exert strong influence over the direction in which the research and education should be done. [...] Second, as a company it is fun and great to see results. This makes it also more enticing to companies to invest more in such a relationship. A <b>relationship should be mutually beneficial</b> and you therefore have to be open for each other’s goals. I would say to every university: <b>have a roundtable discussion with influential companies</b>, ask what are your goals for the coming five years, then present your own goals for the coming five years, and then ask how can we relate these goals to each other.”</p>  |
| ICOMP68 | <p>“Each partner usually has its own region or rayon it services. <b>Partners tend to be regionally bounded due to their customers located within their regions</b>. [...] As such, you could say that the regional dimension is more or less important to our organization. [...] They (partners, red.) also often deliver hardware, infrastructure services and consultancy. An additional category are value added resellers, that produce tailor-made software upon the platform delivered by FinComp. Apart from this, <b>there are no other forms of partnerships directly targeted at FinComp</b> such as employee exchange or testing.”</p>  |
| ICOMP69 | <p>“<b>the intangible nature of software makes geographical proximity almost irrelevant</b> contrary to manufacturing industries. [...] Now and then a partnership happens to occur between two companies located within the same region. [...] But we do not have such partnerships that are initiated from our side. [...] <b>We really do not care where other companies are located, as long as we see the benefits of partnering with them.</b>”</p>  |
| ICOMP70 | <p>“interesting place to acquire and exchange interesting knowledge and to get some insights in interesting developments taking place. [...] But this (having contact with the incubator, red.) occurs on an ad-hoc basis. We do not really maintain any formal ties, but you see that incubators flourishes. [...] You can really see the <b>incubator contributing to the economic dynamism</b> of this region. And such things are really nice developments taking place within the region.”</p>  |
| ICOMP71 | <p>“this is <b>considered natural because FinComp is a large company</b> and we are therefore not in direct need of partners located within our direct vicinity. [...] And the reason behind the ad-hoc nature of our relationships is that when we maintain formal relationships with other companies, such relationships tend to become really formal, literally speaking. We then quickly search for global partners who could help us out in a quick manner on a global scale. <b>When a relatively small company knocks on our door to test our software, this is just less relevant</b> to us. [...] You see, we have an immense customer base. We therefore look for additions to our software products that are able to impact our entire customer base. Little players within the region are often not able to provide this, hence our global perspective. [...] Also, when we acquire a component from a local player that is only available in Dutch, our Australian colleagues will immediately ask for an English version since they want to offer it to their customer as well. You can see the problem that arises here.”</p> |

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| ICOMP72 | <p><i>“the <b>influx from universities</b>. I think FinComp could contribute more to universities, however. We faced lots of reorganizations and FinComp had an inward looking attitude. But I think companies such as FinComp and 3M can <b>greatly benefit from such regional relationships with universities</b>. The <b>government could also contribute to this</b>, whether this is done by local governments or the national government. Such things have to be stimulated.”</i></p>  |
| ICOMP73 | <p><i>“organizing information sessions, creating software community, and so forth. FinComp and other companies are then also <b>willing to contribute to such initiatives</b>.”</i></p>  |
| ICOMP74 | <p><i>“When I look at the Topsectorenbeleid, I become quite sad because they miss out on so many valuable opportunities out there. Most definitely (opportunities, red.) at companies such as UNIT4, FinComp, and other software companies within our country. [...] The funny thing is, when you at the hardware industry, the greatest share of those business are primarily located in the United States. But when you look at what Europe has to offer with enormous companies such as SAP but also companies like FinComp, UNIT4 and AFAS in the Netherlands, <b>we have a wide array of interesting companies with modern technologies</b>. But I notice <b>very little attention is paid</b> to this. I find this truly sad. [...] I know of wonderful technologies invented here in the Netherlands, but just so little attention is paid to the software companies bringing forth those new inventions. It makes me sad that American software companies copy jaw-dropping solutions invented over here and then achieve great fame and profits whereas the inventors themselves here in the Netherlands clearly fail to achieve a similar status.”</i></p> |
| ICOMP75 | <p><i>“I still think the Netherlands is quite famous for its knowledge-based economy and is therefore a relatively interesting market in which software products can be launched. [...] We as an industry should most definitely try to <b>focus more on our expertise and profit from this</b>, however.”</i></p>   |
| ICOMP76 | <p><i>“For instance, FinComp produces administrative software. Our software products are very much <b>dependent on the legislation formulated by the government</b>. As such, we often encounter them in all kinds of panels on a yearly basis.”</i></p>   |
| ICOMP77 | <p><i>“We experience the <b>national government to be irresponsible and slow</b>. A realistic scenario would be the national government deciding on 27 December that a piece of legislation relevant to our software should be changed in our software product before 1 January. We would need at least 80 man-days to properly address this change. This is impossible.”</i></p>  |
| ICOMP78 | <p><i>[... the <b>administrative software industry is highly dependent on the government</b>, the interviewee argued that this dependence is] “enormous. I mean, if the government formulates an extremely complex piece of legislation and decide to implement this one week before the new year [...] we will have to adjust our software without knowing what exactly the details of the new or changed piece of legislation will be. This is has an enormous impact in our business. [...] We are often <b>informed at a late stage of the final details of the new or revised piece of legislation</b>. I do not call this ad-hoc behavior since the topics are known beforehand, but you will notice the government will take a decision short before the deadline. We then have very little time at our disposal to carry out the necessary changes to our software. But at the same time, the government will place</i></p>  |

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|         | <i>significant pressure on our business to get our software fixed. Even more because we deliver software to the government – the same goes for UNIT4 and AFAS.”</i>   |
| ICOMP79 | <i>“(FinComp has, red.) <b>very little to do with the regional government</b>. Legislation is being passed down from the national government anyway, so this is not a problem. There is, for instance, no salary-related legislation per region. [...] As a consequence, we have little to do with them.”</i>   |
| ICOMP80 | <i>“We are a global player. An example would be the <b>government introducing us at their peers in other countries</b> (to market our services, red.). [...] In the Netherlands we have a relatively high penetration of product software used by all kinds of various organizations. If these successes could be evangelized to organizations in other countries and see what Dutch product software companies such as FinComp or UNIT4 have to offer, I think this would be greatly beneficial to our business.”</i>  |
| ICOMP81 | <i>“<b>the role of regional governments supporting their own software industries is limited</b>. I think our industry, and in particular bigger players such as FinComp and UNIT4 benefit the most from tax benefits related to innovation expenditures. [...] I think that even <b>the current role of the regional government is opaque</b>. Ask a handful of software companies what they know about the government in their region. I think most companies will have no clue. [...] In other words, I can imagine the national government being an influential player that is able to, for instance, advocate our interests on the global stage. But the regional and local governments? <b>Their influence seems limited</b> and will primarily concern providing housing for employees, promoting our region to attract more people, and so forth.”</i> |
| ICOMP82 | <i>“<b>we do recognize their</b> (educational institutions, red.) <b>value</b>. However, I think <b>we have paid little attention to them</b> over the past few years. Too little actually. [...] <b>We would like to pay more attention</b> to this, however. Examples are maintaining better ties with scientists at universities who perform research on software engineering models, software product management, and so forth. From my point of view I strongly support this and <b>associate clear benefits with it</b>. Right now, however, such <b>collaboration occurs on an ad-hoc and reactive basis</b>.”</i>   |
| ICOMP83 | <i>“<b>Short-term thinking rules our agendas</b> and we therefore are not able to take part in projects that span multiple months (such as comprehensive research projects, red.).”</i>   |
| ICOMP84 | <i>“FinComp recognizes the value it has (partnering with educational institutions, red.), but <b>a structural change is required</b>.”</i>  |
| ICOMP85 | <i>“I think <b>contact on a higher level</b> (with universities, red.) <b>should be intensified</b>. [...] I do not know where to start, however, since <b>we as FinComp have no insight in what a university could offer</b> in terms of knowledge, assistance, information, research, and ongoing projects.”</i>  |
| ICOMP86 | <i>“<b>we do partner with universities, but indeed on a lower level</b>. An example is students who apply at FinComp for an internship. But this occurs on an individual basis without any formal structure, without any concrete plans. For instance, there are no research directions formulated that aim at exploring our sales models to create better business cases, and so forth.”</i>   |
| ICOMP87 | <i>“<b>We train our people in-house</b>. For instance, we even recruit people who studied at the</i>  |

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|  | <p><i>Hogere Hotelschool (Higher Hotel Management School). They are very customer oriented and are apt enough to understand our business. Like all of our other employees, regardless of their background, we train them in the workplace. [...] In that sense, <b>we do not really care about the mismatch between the curricula of universities and our needs.</b> [...] However, we do signal that there is a <b>lack of graduates with enough fundamental knowledge</b> on topics such as software architecture that we consider essential. But again, we are capable of training our employees while they are on the job, so I would not call this a major issue. [...] Despite all this, I do believe that <b>it is really important to maintain a good and constructive dialogue between companies and universities.</b> Universities should be aware of the needs of software companies, and software companies should indicate what kind of graduates are much sought after. [...] In sum, I think <b>it is crucial for universities and companies to know what they are both up to.</b> Issues and mismatches will always exist, but as long as affairs are properly handled on a higher level, we will all be fine."</i></p> |
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**Table 28: Overview of quotation identifiers used for interviews conducted with governmental representatives**

| Identifier | Quotation  |
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| IGOV1      | <p><i>"Utrecht has departed from the idea that regional economic policy should be formulated based on classical economic sector analyses. [...] In short, <b>we now regard the ICT industry as a crucial enabler for economic growth to take place, rather than an industry on its own.</b> We therefore regard the ICT industry as a part of a much larger and interconnected network, rather than an individual industry. [...] I think it goes without saying that since we consider ICT as a core enabler of regional economic development, that <b>we strongly believe that our ICT industries are essential and therefore deserve our full attention.</b>"</i></p> |
| IGOV2      | <p><i>"For instance, when you look at the Topsectorenbeleid, you will notice that ICT is not listed as a separate sector. The reason behind this, is that <b>the ICT industry is also regarded as an enabler from a national perspective. The presence of a successful ICT industry makes or breaks a national economy.</b> We derived our regional perspective from this national perspective."</i></p>   |
| IGOV3      | <p><i>"<b>You should not expect a civil servant to have knowledge of the software industry.</b> A civil servant is responsible for shaping an effective framework and atmosphere in which businesses can unleash their maximum potential. They do this by recognizing and defining prerequisites (randvoorwaarden, red.) such as the attraction and retainment of talented employees within the region, providing a modern digital infrastructure, manage business areas (bedrijventerreinen, red.), and so forth."</i></p>  |
| IGOV4      | <p><i>"a shift can currently be witnessed. <b>Governments within our region are currently in a transitional period towards this modern take on ICT.</b> Right now, my answer is that <b>civil servants have no clue about anything related to ICT.</b> But this is changing rapidly and it is still work in progress. I do get your point, however, which is also why we, including those civil servants, very much welcome the research you perform with Sjaak Brinkkemper and several others."</i></p>   |
| IGOV5      | <p><i>"It (CoopUtrecht, red.) is an important ICT network and an important link to connect</i></p>   |

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|        | <p>companies and governments. However, <b>we do not yet have a fancy ICT monitor like we have for the gaming industry by means of which we can monitor economic growth.</b> [...] But we will still have to come up with a way on how we can realize this (monitoring the performance of the software industry, red.), since <b>we deviated from the idea that we should measure every industry on its own.</b> [...] We are therefore way more interested in questions such as: how do you apply ICT in the most optimal way to accelerate growth in regional economies? [...] Research conducted by the University of Amsterdam on the financial ICT cluster in Amsterdam several years ago indicated that there are ample opportunities for that industry to grow, thanks to the presence and complementary needs of financial organizations within their vicinity. These companies require highly specialized financial software, therefore sparking entrepreneurship and interest in their regional ICT industry.”</p> |
| IGOV6  | <p>“If governments formulate regional economic policies without even gauging the opinion or needs of an industry, then you will be keelhauled as soon as it gets published. [...] Right now <b>it is considered essential to formulate regional economic policies in cooperation with practitioners or representatives from various types of industries.</b> If you do not do this, you will see a regional economic policy that does not address nor match the needs of industries.”</p>   |
| IGOV7  | <p>“Two years ago we organized various <b>roundtable sessions.</b> We organized such roundtable sessions for different types of industries, that we now organize on a routine basis, to check whether practitioners agree with what we have in mind. At the same time, their opinions steer us in a specific direction by indicating where we should direct our attention at. This is one of the most important characteristics of the EBU: <b>industries themselves have to indicate what is important to them, so that we are able to formulate policies that most optimally match with their needs.</b>”</p>   |
| IGOV8  | <p>“When we look at sectors on their own, it speaks for itself that we only invite representatives from that specific industry. However, sometimes we also organize gatherings with a specific theme. If that is the case, we invite representatives from different kinds of industries to allow for a <b>cross-fertilization of multiple industries and to see if something interesting can be done.</b> [...] We then ask various parties such as CoopUtrecht whether they know any interesting people we could invite to attend the roundtable sessions.”</p>  |
| IGOV9  | <p>“<b>ICT companies should seek to collectively organize themselves.</b> For instance, the gaming industry is a prominent example of where it goes wrong. Company A yells something, company B yells something, and these companies have no idea what their peers are up to. They should aim to <b>bundle their forces to have more speaking volume to more effectively communicate their short and long-term needs and issues to us.</b>”</p>   |
| IGOV10 | <p>“Entrepreneurs have always been very much focused on surviving, their own customer base, their own assets, and so forth. As companies grow, you tend to notice a gradual <b>shift towards specialization that augments the need to collaborate and seek for complementarities among companies.</b>”</p>  |
| IGOV11 | <p>“what is really important here, is that <b>companies should embrace the principle of reciprocity: be able to give and take, even when your direct competitors are involved.</b> An</p>   |

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|        | <p>example is the competition for graduates. The flow of skilled graduates is often low, and companies tend to hunt on their own. However, <b>only together will they be able to address the deficient flow of graduates and be able to attract attention from other stakeholders</b> such as governments and educational institutions. But sadly, such a change in attitude has not yet occurred.”</p>   |
| IGOV12 | <p>“If an account manager, domain manager, or whoever (public official, red.) that stays in touch with companies recognizes various signals that point in the direction of potential issues or opportunities for which we could provide assistance, he or she will double check such sentiment at other companies. A couple of other companies including trade organizations are then often asked whether they recognize the signaled problem, to ensure these problems are indeed experienced within an industry. However, companies themselves can also raise their own finger and indicate to the government with what kind of problems they are dealing with. [...] <b>There are therefore no one-way communication channels or a proactive or reactive attitude, but a combination depending on the situation.</b>”</p>  |
| IGOV13 | <p>“Although that is another discipline, I am able to give you an <b>example of effective interregional collaboration</b>. For instance, the municipality of Amersfoort already has a fiberglass network in place that is widely available. What is more, they also created a network where potential exploiters of the fiberglass network can inform themselves of the possibilities for their businesses. We here in Utrecht (the municipality, red.) would like to achieve a similar situation, so we are therefore studying our situation together (with the municipality of Amersfoort, red.) and <b>see what we can learn from each other</b>. I think this is major step in the right direction. [...] I also know that for the Digitale Steden Agenda (Smarter Cities Agenda) in which multiple large municipalities are involved that such as Amsterdam, Rotterdam, Utrecht and The Hague, <b>engage in intercommunal discussions to see how they can aid each other</b>. I therefore do know that such initiatives exists, but I have no knowledge of all the details.”</p> |
| IGOV14 | <p><b>the success of such interregional or intercommunal collaboration “strongly depend on the attitude and vision of responsible aldermen or governors</b>. In (the municipality of, red.) Amersfoort, the aldermen were really progressive and wanted the ICT sector to take a leap forward to be prepared for the future. They therefore decided to place great emphasis on financing an extensive fiberglass network and related services to spark innovation, to experiment what business opportunities could arise thanks to a fiberglass network. The result is that the municipality of Amersfoort is now approximately two years ahead of Utrecht in terms of modern technology. [...] But what is important and what we appreciate very much, is that they are willing to share their experiences with us. This way mutual benefits are achieved and we all benefit from it, rather than competing between our municipalities.”</p>   |
| IGOV15 | <p>“<b>complementary regional economic policies are becoming increasingly prevalent</b>. It took a while, but the municipality of Utrecht now starts to realize that if we are located approximately 20 minutes from each other (other municipalities, red.), it makes figuratively speaking no sense to compete to the death. This sentiment is reinforced when you look at our competitive capabilities from an international perspective, that shows</p>   |

|        |   |
|--------|---|
|        | <p>that (the municipalities of, red.) Utrecht nor Amersfoort are able to compete with other large cities around the world. It therefore makes more sense that the Utrecht region would join forces with the region of Amsterdam to present a joint vision and proposition to the increase our competitive capabilities. [...] This is an example of <b>making use of economies of scale</b>. [...] However, <b>such processes are time consuming and demand significant effort from both parties</b>. From a municipal perspective, the aldermen and his colleagues have the assignment to strengthen the position of their own region. [...] So you can imagine that these people have a very <b>inward-looking perspective</b> when it comes to regional collaboration.”</p>  |
| IGOV16 | <p>“One of classical examples I hear the most, is a venture capital fund. We do not have such a fund at the moment nor have we ever had one in the past within this region. However, we are <b>currently engaged in talks with various parties to explore the possibilities of the creation of such a fund</b>. [...] However, similar concepts already exists and are called regional development authorities (regionale ontwikkelingsmaatschappijen). Examples of such authorities are OOST-NV and LIOF that provide financial capital to promising start-ups and initiatives. They also participate on a board level of these companies. In short, they kind of are a type of venture capitalists, but they favor the interests of regional development (such as job creation and innovation, red.) over solely focusing on economic gains. However, it goes without saying that such regional development authorities also want to see their investments returned.”</p> |
| IGOV17 | <p>“the <b>lack of a clear profile</b> that makes Veenendaal appear to be colorless and uninteresting to outsiders (such as investors and entrepreneurs, red.)”</p>   |
| IGOV18 | <p>“We regard <b>the ICT industry as an ideal industry to serve as an engine for growth, innovation and sustainability for the entire business landscape</b> in Veenendaal and other domains such as education, health care and shopping. [...] We also aim to profile Veenendaal as the place where the magic happens, the ICT-city within the successfully developing Food Valley.”</p>   |
| IGOV19 | <p>“increase awareness among industries that <b>the ICT industry in Veenendaal is able to accelerate their path towards sustainability and economic development</b>”</p>  |
| IGOV20 | <p>“increase awareness among the population that <b>the ICT industry</b> (in Veenendaal, red.) <b>can be an engine for change and sustainability</b> within multiple public domains such as education, research, shopping and health care.”</p>   |
| IGOV21 | <p>Veenendaal is also aiming to achieve a <b>“strong reputation as an ICT-city on higher administrative levels</b> within the Food Valley, as well as within the province of Utrecht.”</p>  |
| IGOV22 | <p>“We see ourselves as profilers of our ICT industry: <b>we facilitate and connect companies</b> together. We aim to bring the people together to achieve the goals I mentioned before. [...] However, I do have to admit that <b>our budget is really small</b>. We have some cash, but not much. We see ourselves as <b>bridge-builders</b>: our municipal council (consisting of the mayor and aldermen, red.) has a similar attitude.”</p>   |
| IGOV23 | <p>Veenendaal places <b>“strong emphasis on connecting software companies within our industry with each other, as well as with us</b> by means of an ICT platform. This ICT platform consists primarily of CEOs and other influential industrial representatives who are willing to negotiate with us and improve the overall status of our region. [...] We also</p>   |

|        |  |
|--------|--|
|        | <i>maintain ties with (the cooperative network, red.) CoopFoodValley because of their role as a market place where exchange (e.g. of knowledge, goods and services, red.) among software companies takes place."</i>   |
| IGOV24 | <i>"both means of communication are important. [...] We <b>maintain a proactive communicative stance</b> when it comes to the orchestration of the ICT platform and our ties with CoopFoodValley. In addition, we also created a separate page on the website of our municipality containing our vision on where our ICT industry should be heading in the future. On this page, <b>people working in the software industry can leave their comments and either express their support or dismay</b> concerning our plans. We then get back to them, if we can, to exchange thoughts. [...] We also publish our plans in newspapers and communicate this at various gatherings, but the latter means of communication are one-way traffic and therefore less interactive.[...] Besides, we sometimes also <b>invite several people over from the industry to discuss our plans</b> and to get their opinion on what we could do to improve our plans for the future."</i> |
| IGOV25 | <i>"<b>dedicated and designated people</b> (including third-parties, red.) whom software companies can contact in case they have any questions related to municipal affairs."</i>  |
| IGOV26 | <i>"We really see the Food Valley as our community. We profile our municipality as the ICT-city within the region, and it is therefore in our interest to communicate our plans as clearly as we can. [...] In addition, municipalities that are part of the Food Valley are more or less obliged to communicate their plans in same way as we do. We deliberately chose to work together as one region (the Food Valley, red.) – we are not doing this for fun, you know. [...] The current economic climate more or less forces us to <b>scale up and cooperate.</b>"</i>  |
| IGOV27 | <i><b>every municipality eventually "acts in their own interest,</b> rather than looking at the overall well-being and development of our region."</i>   |
| IGOV28 | <i><b>this behavior</b> (competition between regions, red.) <b>can be considered entirely "normal and logical.</b> Aldermen, in the end, are responsible for the results of their own municipality. If they want to be re-elected, they better make sure that the overall situation of their own municipality has progressed instead of allowing another municipality within the Food Valley to grab an opportunity at the cost of their own (municipality, red.)."</i>  |
| IGOV29 | <i>"Like any other governmental institution, you really have to <b>avoid any possible distortion of competition.</b> [...] This is why we do not prefer to take on a proactive role to support the software industry. [...] We therefore primarily see ourselves, just as I mentioned before, as a <b>bridge-builder and facilitator.</b> We aim to bring software companies together, including ourselves, to facilitate the exchange of mutually beneficial knowledge and to promote inter-organizational partnerships."</i>   |
| IGOV30 | <i>Veenendaal aims to "<b>forge alliances with research and educational institutions to reach an optimal balance between educational programs offered by such institutions and the needs of companies</b> located within our region."</i>  |
| IGOV31 | <i>"we prefer to do as much as we can to support our local software industry, albeit as a <b>bridge-builder and facilitator rather than a powerful player.</b>"</i>  |

## Survey Enquête Software in Nederland II

[Pagina's](#)[Variabelen](#)[Cases](#)[Codebook](#)[Statistieken](#)[Druk af](#)**Software in Nederland II**

**(U kunt deelnemen aan de enquête door hieronder op de knop "Ga verder" te klikken.)**

Geachte collega's in de software-industrie,

Onze software-industrie floreert en doet zowel landelijk als internationaal goede zaken. Echter is het onbekend hoe het grote publiek. Regionale overheden blijken lang niet altijd op de hoogte te zijn van deze hoogwaardige kennisindustrie in hun regio, en missen we inzicht in de structuur en dynamiek van regionale software-industrieën zoals samenwerking met kennisinstellingen en bedrijven onderling. Dit alles belemmert de kansen van Nederland als kenniseconomie en motor voor nieuwe producten, diensten en werkgelegenheid, ook in andere economische sectoren. Om deze redenen is een groep onderzoekers aan de Universiteit Utrecht gestart met een groot inventariserend onderzoek naar de Nederlandse software-industrie.

Door middel van een grootschalige enquête onder productsoftwarebedrijven in Nederland, onderzoeken we de ondersteuning door de overheid aan regionale software-industrieën, de samenwerking met regionale kennisinstellingen, en de samenwerking van bedrijven onderling. Ook verzamelen we cijfers over totale omzet, werkgelegenheid, groeiverwachting, en productsectoren. Dit onderzoek met de naam Software in Nederland II is een uitbreiding van een eerder onderzoek in 2010 genaamd "[De software sector in Nederland](#)", en geschiedt met ondersteuning van de [Software VOC](#), [TNO Informatiemaatschappij](#), [Skillcity](#), [Dialogic](#), de [Aalto Universiteit](#) te Finland, en de [Technische Universiteit Darmstadt](#) te Duitsland. Uiteindelijk levert het onderzoek een rapport op met de resultaten en een analyse op basis van de ingevulde enquêtes, alsmede concrete adviespunten richting overheden, kennisinstellingen en softwarebedrijven om onze software-industrie sterker op de kaart te zetten.

Wij hopen dat u bereid bent ons te helpen om Nederlandse software-industrie sterker op de kaart te zetten. Het invullen van de enquête door ons testpanel bestaande uit partner managers nam gemiddeld 12 minuten in beslag. De vragenlijst kunt u invullen tot en met **woensdag 17 juli**. Al uw gegevens worden onder strikte geheimhouding verwerkt en geanalyseerd tot algemene economische statistieken. Uit de informatie die wij uiteindelijk publiceren, zijn nooit herkenbare gegevens over een afzonderlijk bedrijf af te leiden.

Alle deelnemers aan het onderzoek krijgen een samenvatting van de uitkomsten. Wij wijzen er u nogmaals op dat uw medewerking helpt om de softwaresector in Nederland beter op de kaart te zetten. Onze industrie verdient dit. Wij rekenen op u! Indien u vragen heeft kunt u contact opnemen met Vincent Blijleven (uitvoerder), [V.B.Blijleven@uu.nl](mailto:V.B.Blijleven@uu.nl).

Bij voorbaat dank en met vriendelijke groeten,

Prof. dr. Sjaak Brinkkemper

Hoogleraar Software Production

## General Information

### Which of the following options best describes your business?\*

Please select the one that applies best.

### Please estimate how the revenue of your firm is distributed among the following options.

Please estimate your answer in percentages.

|  | %                    |
|--|----------------------|
| Software products  | <input type="text"/> |
| Embedded software  | <input type="text"/> |
| Delivery of software projects (tailor-made software) or other related services | <input type="text"/> |
| Consulting in the software industry or closely related to it                   | <input type="text"/> |
| Reselling  | <input type="text"/> |
| Other  | <input type="text"/> |

### Please indicate in which of the following provinces your company is headquartered.\*

### Please indicate in what municipality your company is situated.\*

Please write down the name of the municipality (gemeente) where your company is situated (gevestigd).

### Please estimate the following figures for your firm's last fiscal year and this fiscal year.

Please estimate your answers in euros. If not known or unwilling to disclose, please leave blank.

|  | €                    |
|--|----------------------|
| Revenue in 2012  | <input type="text"/> |
| Revenue forecast for 2013  | <input type="text"/> |
| Research and innovation expenses in 2012   | <input type="text"/> |
| Operating profit in 2012 (profit before extraordinary items, interests, and taxes) | <input type="text"/> |

### Please estimate the following figures for your firm's last fiscal year and this fiscal year.

Please estimate your answers in FTEs (full-time equivalents).

|  | FTE                  |
|--|----------------------|
| Personnel at the end of 2012           | <input type="text"/> |
| Personnel forecast for the end of 2013 | <input type="text"/> |

### Please estimate the following figure for your firm's last fiscal year.

|  | %                    |
|--|----------------------|
| Percentage of revenue that came from international markets in 2012 | <input type="text"/> |

### In what year was your company founded?\*

## Business Models & Organization

### How well do the following statements describe the growth of your firm?\*

With growth (economic expansion), we mean an increase in the amount of goods/services offered by your company, paired with an increase in revenue (omzet).

|  | Strongly disagree     | Disagree              | Do not agree or disagree | Agree                 | Strongly agree        |
|--|-----------------------|-----------------------|--------------------------|-----------------------|-----------------------|
| Growth is the most important objective of our firm                         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The growth of our firm must not take place at the expense of profitability | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| Our firm must grow even if it means that we would need to take more risks  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| We aim at strong growth in international markets                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |

### To what customer segments do you sell your products or services?\*

Please select all customer segments that apply.

### For which third party software platforms has your firm developed software in 2012?

Please select all applicable platforms.

### For which third party software platforms does your firm plan to develop new software in 2014?

Please select only those platforms for which your firm intends to develop **new** software. Leave blank if your company does not intend to target any new platforms.

### Which of the following best describes your company's main product?\*

Please choose only one.

### How many different software products does your company offer?\*

Product lines count as one product.

- No software products.
- 1 product / product line
- 2-3 products / product lines
- 4 or more products / product lines

### Please estimate what percentage of the total working capacity of your company in the Netherlands is focused on the following activities:

Please ensure a total of 100%.

|   | % |
|---|---|
| Executive board                             |   |
| Research and innovation                     |   |
| Software development (programming, testing) |   |
| Marketing and/or sales                      |   |

## Regional Government Relations

Please indicate how important the following stakeholders are to your company's economic value in the next 3-5 years.\*

|                                       | Not used              | Not important         | Slightly important    | Important             | Very important        |
|---------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Own staff                             | <input type="radio"/> |
| Customers                             | <input type="radio"/> |
| Government                            | <input type="radio"/> |
| Investors                             | <input type="radio"/> |
| Suppliers                             | <input type="radio"/> |
| Media (e.g. newspapers, social media) | <input type="radio"/> |

Which regional government activities apply to your company?

Please select all that apply. If no activities apply to your company, leave blank.

Please indicate whether you agree or disagree with the following statements.\*

|   | Strongly disagree     | Disagree              | Do not agree or disagree | Agree                 | Strongly agree        |
|---|-----------------------|-----------------------|--------------------------|-----------------------|-----------------------|
| The government in our region is aware of the presence of our regional software industry   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The government in our region recognizes the value of our regional software industry.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The regulators and policy makers in our region who have influence over our software industry, understand the economics of our industry. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| It is easy to determine the best way to interact in a productive way with the regional government.                                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| Additional government involvement is good for my business.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The regional government often uses unfair rhetoric when talking about our industry.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| It is easy to accomplish anything when working with the regional government.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |

## Regional Educational Institutions

Please indicate whether your company is involved in any of the following activities with regional educational institutions.\*

|  | Yes                   | No                    | Don't know            |
|--|-----------------------|-----------------------|-----------------------|
| The offering and fulfillment of student internships at my company.                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Taking part in organizing seminars.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Taking part in joint research projects of which the results are mutually beneficial. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Giving guest lectures at universities or higher education institutions.              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sharing of results of research projects relevant to my company.                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Providing our software for use at educational institutions.                          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Please indicate whether you agree or disagree with the following statements.\*

|  | Strongly disagree     | Disagree              | Do not agree or disagree | Agree                 | Strongly agree        |
|--|-----------------------|-----------------------|--------------------------|-----------------------|-----------------------|
| Maintaining relationships with higher education institutions (HBOs) and universities within my region is important to my company.                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The benefits of collaborating with HBOs and universities within my region are clear to my company.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| My company would like to cooperate more actively with HBOs and/or universities located within my region.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| HBOs and universities are aware of the needs of software companies located within my region.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The research performed by HBOs and universities complement the needs of software companies within my region.                                       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| It is easy to get in contact with HBOs and/or universities within my region.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |
| The software industry within my region is able to exert influence over the educational programs offered by HBOs and universities within my region. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/> |

## Regional Partnering

Which of the following forms of regional partnering are important to your company?

Please select all that apply. You can add other items to the list by typing them in the text field, and then click on 'Toevoegen'.

Please indicate whether you agree or disagree with the following statements.\*

Please note: the word "region" refers to a radius of 50 kilometers from your location (reachable within an hour).

|   | Strongly disagree     | Disagree              | Do not agree or disagree | Agree                            | Strongly agree        |
|---|-----------------------|-----------------------|--------------------------|----------------------------------|-----------------------|
| I know what software products or services are produced by software companies located within my region.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/>            | <input type="radio"/> |
| Software companies within my region are willing to cooperate with each other.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/>            | <input type="radio"/> |
| Relationships with other software firms within my region are an important source for the innovative performance of my company.                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/>            | <input type="radio"/> |
| Relationships with customers within my region are an important source for the innovative performance of my company than customers located outside of my region. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/>            | <input type="radio"/> |
| Relationships with customers within my region are a greater source of innovative performance for my company, than customers located outside of my region.       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input checked="" type="radio"/> | <input type="radio"/> |
| Regional cooperation with other firms has clear added value for my company.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/>            | <input type="radio"/> |
| The greater the distance between my company and other software companies, the less effective the relationship tends to be.                                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/>            | <input type="radio"/> |

## Information About Informant

On which level do you work in your company?\*

Please choose the one that applies best.

- Management team
- Upper management
- Middle management
- Other

In order to receive a copy of the results and analysis of this survey, please provide an email address:

Anonymity is guaranteed. The email address provided will **not** be used for any other purposes.

Email address... (optional)

(Optional) Please provide us with feedback to support the software industry.

Your feedback could for instance be about the questions asked in the survey, or something else you would like to say about something that was not part of the survey.