BACHELOR THESIS

17/06/2013

THE ROLE OF THE GERMAN GOVERNMENT IN THE EIT ICT LABS

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I. ABSTRACT

This thesis analyses the role of the German Government in the European initiative EIT ICT Labs which aims at promoting the commercialization of knowledge in the European Union. The main the research question is 'What is the role of the German Government in the EIT ICT Labs?' Based on a case study, empirical evidence is primarily gained from official documents published by German and European political authorities and interviews. The analysis of this data suggests that the role of the Federal Government is to support the implementation of Triple Helix innovation networks within the concept of multi-level governance. For that purpose, the German Government uses the policy instrument of information to mediate between the stakeholders of the Triple Helix network.

KURZFASSUNG

Diese Bachelorarbeit untersucht die Rolle der deutschen Bundesregierung in der europäischen Initiative EIT ICT Labs, welche sich zum Ziel setzt, die Innovationskraft der Europäischen Union zu stärken. Vor diesem Hintergrund ist die Leitfrage: 'Welche Rolle spielt die Bundesregierung in den EIT ICT Labs?' Mithilfe einer Fallstudie werden empirische Daten aus offiziellen Dokumenten deutscher und europäischer politischer Akteure und durch Interviews gewonnen. Die Analyse dieser Daten lässt vermuten, dass die Funktion der Bundesregierung vor allem darin besteht, Innovationsnetzwerke nach dem Triple-Helix-Modells innerhalb des Konzepts der Multilevel Governance zu fördern. Dabei nutzt die Bundesregierung das Politikinstrument der Information, um zwischen den Triple-Helix-Netzwerkpartnern zu vermitteln.

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I. LIST OF ABBREVIATIONS

BMBF Federal Ministry of Education and Research

BMWi Federal Ministry of Economics and Technology

EIT European Institute of Innovation and Technology

EU European Union

HE Higher Education

ICT Information and Communication Technology

KIC Knowledge and Information Community

SIA Strategic Innovation Agenda

SME Small and Medium Enterprises

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(1)   THE IDEA OF THE **EIT ICT L**ABS

'The Union has today set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.' (Lisbon European Council, 2000).

This is the ambitious goal, set by the European innovation agenda of 2000 – the Lisbon Strategy – and its revised version of 2005 – the Lisbon Strategy for Growth and Jobs. In order to achieve this goal, the European Union (EU) and its Member States were encouraged to perform actions which should lead to (Commission of the European Communities, 2005):

- a rise in the EU's attractiveness for investments and for labour force,
- an increased creation of qualified work and
- the promotion of knowledge and innovation in their function as key enablers of economic growth.

These more specific goals – and in particular the latter – indicate that the EU's performance in commercialization of knowledge is not only affected by actions in the sector of innovation. They rather imply strong mutual linkages and reciprocal interdependencies between the three policy sectors of innovation, research and industry (Soriano & Mulatero, 2010, p. 291). By recognizing these interdependencies, the EU especially calls for (Izsak & Griniece, 2012, p. 10):

- strengthening the relationship between research and business as well as
- reinforcing the linkages between research, education and innovation.

Hence, multinational, small and medium enterprises (SME) as well as universities and research institutes need to co-operate in order to improve the commercialization of knowledge in the EU (European Commission, 2007). One concrete mechanism particularly committed to strengthening their linkages through systemic interactions is the knowledge triangle promoted by the European Institute of Information and Technology (EIT) (see Figure 1: EIT knowledge triangle). This approach of the knowledge triangle makes the EIT being 'an innovation in the European context with respect to traditional ways of thinking about and organising research' (Gornitzka, Olsen, & Stensaker, 2007, p. 198). This organisation of research means also specialising policy actions along the

most important fields of research. Therefore, the EIT operates through units called Knowledge and Information Communities (KICs) concerned with:

- climate change through the ClimateKIC,
- sustainable energy through the KIC InnoEnergy and
- information and communication technology (ICT) through the EIT ICT Labs.

The selection of these three areas was primarily based on the identification of eco-innovations as well as ICT as 'picking winner' areas in the Lisbon Strategy for Growth and Jobs (Jones, 2008, p. 7). In particular the sector of ICT is here the relevant key driver for innovation and growth in Europe. In concrete terms, it is considered to be the backbone of the knowledge economy the EU targets to become (Commission of the European Communities, 2005). Thus, the EIT ICT Labs is of considerable relevance to the commercialization of knowledge and therefore, is put in the focus of this research.

Like the other KICs, the EIT ICT Labs offers EIT labelled HE programs at Master and PhD level at its partner universities in the different Member States (European Insitute of Innovation and Technology, 2012). The most important component of these EIT programs is the provision of entrepreneurial training to the students. Therefore, a strong network of partners of industry, research and HE is needed. The Member State with probably even the strongest network of this kind is Germany (EIT, n.d.). Here, the evolution of strong university-industry partnerships was especially supported by the German Government. In that context, the Federal Government launched the national innovation strategy High-Tech Strategy in 2006 and the renewed version – High-Tech Strategy 2020 – in 2010. Concretely, these strategies initiated by the Federal Ministry of Education and Research (BMBF) still aims at creating new jobs and improving the citizens' living standards. The Ministry saw an urgent need for this innovation strategy due to the competencies of the Federal Government in the field of the so-called 'Großforschung' which describes research activities considered beneficial to the whole society (Federal Ministry of Education and Research, 2010). However, due to the federal structure of Germany, there are also important competencies in the innovation policy granted to the sixteen German federal states. These competencies concern especially research activities corresponding to the regional potential and local problems (Deutscher Bundestag, 2012, p. 229). Moreover, the competencies of the federal states lie in the field of education and higher education (HE) where research is traditionally pursued.

However, also the BMBF engages in abstract terms in HE by generally strengthening the HE's position in Germany and by accelerating the commercialization of new findings in research.

Referring back to the HE programs supported by the EIT, the 'outstanding project' of the EIT ICT Labs is the Software Campus (EIT ICT Labs, 2011). The Software Campus provides entrepreneurial training to Master and PhD students of informatics and related studies through close co-operation between industry, research and HE. Thus, it promotes the knowledge triangle encouraged by the EIT. This network of industry, research and HE is even complemented by the German Government which is committed to and engages in the operation of the Software Campus. Hence, the Software Campus reflects what Etzkowitz and Leydesdorff (2007) define as the model of Triple Helix which illustrates the linkages and mutual influences between industry, research and HE as well as the government in a dynamic, spiral model of innovation. Like the EU envisages, these linkages result in the construction and strengthening of the knowledge-based society. According to Etzkowitz and Leydesdorff (1998), this evolution of the knowledge-based society can still be accelerated through enhanced communication between the network partners. Hence, communication and exchange of information should be in the focus of actions affecting the Triple Helix network. Moreover, Etzkowitz and Leydesdorff (1997, p. 4) recommend extending nationally implemented networks to the international level in order to further stimulate the process of commercialization of knowledge. This Europeanization of the network is the tasks of the national governments since they build the core of the European innovation policy (Etzkowitz & Leydesdorff, 1997, p. 4). Here, it is referred to the embedding of the national governments in a system of policy actors at different territorial levels. Thus, it is also the role of the national governments within the concept of multi-level governance in the EU that is of considerable importance for the commercialization of knowledge in the EU.

To conclude, this research addresses the role of the Federal German Government in the EIT ICT Labs by having a closer look on the EIT ICT Labs' program Software Campus. In that way, this thesis aims at enlightening a field which has not often been object to studies until now. Even though Jofre & Dannemand Andersen (2009), Colombo, Pirelli & Piva (2008) and Didier (2010) for instance analyse the role of the Member States in the EIT, their governments' role in the KICs has not been analysed. In order to provide general insights into the role of the national governments in the EIT KICs, this thesis investigates the research question:

What is the role of the German Government in the EIT ICT Labs?

In order to answer it thoroughly, three sub-questions (SQ) guide the research process. The first sub-question aims at situating the German policy in the multi-level governance in the EU:

SQ I   *How does Germany with the program Software Campus take into account the European innovation strategy represented by the EIT?*

After outlining the relevance of multi-level governance in that context, the range of possible ways for the German Government to influence the EIT's operation is illustrated. Thus, the second sub-question is:

SQ II   *What policy instruments is the Federal Government using to contribute to the commercialization of knowledge in the EIT?*

Finally, the research interest is narrowed down to the use of one type of policy instrument in the EIT ICT Labs. As Etzkowitz and Leydesdorff (2008) suggest, particularly the communication and exchange of information is important, so that this research aims at answering the following sub-question:

SQ III   *How is the information policy instrument used for commercialization of knowledge in the case of the EIT ICT Labs?*

In order to answer these sub-questions and the overall research question, the thesis presents the theoretical framework in chapter 2. The literature used to build the theoretical framework concerns the model of Triple Helix, the concept of multi-level governance and an overview on policy instruments. For the purpose of describing and illustrating the Triple Helix model, mainly literature of the pioneers in this field – Etzkowitz and Leydesdorff – from 1997 and 1998 is reviewed because this literature explains the underlying assumptions of the Triple Helix network. This basic literature is supplemented by journal articles concerning the implementation of the Triple Helix network in the EU. Since these networks in the EU integrate partners of different territorial levels – at least supranational and national –, the second concept presented is multi-level governance. Here, in particular journal articles of besides others Gornitzka, Dolinar, Papadopoulos and van Kasbergen & van Waarden are used to illustrate what multi-level governance means in the EU. The presentation of the theoretical framework is followed by the explanation of the methodological choices including the operationalization, research design, case selection, data collection and analysis in chapter 3. After providing the empirical basis with the help of a case study in chapter 4, the findings are summa-

rized in chapter 5 in order to answer the sub-questions. Finally, the thesis draws a conclusion on the main research questions.

All in all, this thesis enlightens the role of the German Government as 'catalyst, promoter and regulator' (Kuhlmann, 2001, p. 960) of the European innovation policy in the EIT ICT Labs and the Triple Helix model. In order to ensure the commitment of industry, research and HE, the German Government intensively makes use of the information instrument in form of guiding the implementation process.

However, the results of this thesis cannot be generalized since the case study only exemplifies the role of the German government in the Software Campus as one program of the EIT ICT Labs.

(2) THEORETICAL FRAMEWORK

This chapter presents the theoretical concepts underlying this study. It starts with a conceptualization of the Triple Helix model which explains the linkages between the actors involved in networks promoting the knowledge commercialization. The second section outlines the concept of multi-level governance in the EU. Finally, the chapter closes with a short presentation of policy instruments which can be used to design the innovation policy.

(2.1) TRIPLE HELIX MODEL

The EIT ICT Labs' program Software Campus relies on the integration of industry, research, HE and the German Government into one network in order to provide high quality entrepreneurial education to students. This network of partners clearly illustrates what Etzkowitz and Leydesdorff (1997, p. 3) define as the Triple Helix model.

The Triple Helix concept depicts the relationship between the actors of industry, HE and research as well as the government who mutually influence their innovation performance through linkages and shared functions within their partnership. For instance, the primary interest of industry concerns the exploitation of knowledge. However, the industry nowadays seems to be more closely linked to the HE since recently, the task of knowledge provision has also been performed by industrial actors through their R&D departments. (Ahrweiler, 1997, p. 102) Another example illustrating this task partition concerns the provision of funds for research and education programs which is primarily ensured by the industry sector. However, it is also the government who allocates financial subsidies to research programs and projects. Thus, the model suggests that all actors share 'multiple reciprocal linkages at different stages of capitalization of knowledge' (Etzkowitz & Leydesdorff, 1997, p. 1). Therefore, the Triple Helix represents a dynamic, spiral model of innovation where the partners' interactions accelerate the knowledge-based society what can provoke different effects (Etzkowitz & Leydesdorff, 1997, p. 1). Firstly, there might be an internal transformation of the network. Here, each of the helices engaged in the network experiences changes within its own structure. Secondly, there are – mostly reciprocal – influences which one helix has on another. Thirdly, interactions in the network may cause effects on the whole trilateral structure and thus, have impacts on all sectors – industry, research and education as well

as government. The fourth kind of effects describes the recursive effects within the institutional spheres. (Etzkowitz H. , 1997, p. 142)

After this presentation of the Triple Helix concept, a stronger focus is put on its relevance in the context of HE programs for Master and PhD students such as the Software Campus. The creation of new and the strengthening of existing programs based on Triple Helix networks is supposed to be promoted by the government (Thune, 2010). Its commitment to these programs is mainly based on the interest that the participating students will become an important source of knowledge which can be turned into social capital. This potential is created by the students' ability to flexibly move between the research and industry sector and so, to look at their innovation projects from different angles. (van Vught & Dill, 2010) In this diversity of perspectives, Leydesdorff and Etzkowitz (1998) see the basis for an increased creativity and a facilitated access to knowledge-intensive areas of research what in the end, leads to a dynamic innovation process. In order to further accelerate this knowledge creation and commercialization, in their view national governments should also aim at establishing networks on an international level. In the context of the EU, the national governments are supposed to build the core for these activities and therefore, complement the European policy. (Etzkowitz & Leydesdorff, 1997, p. 4)

In general, three models of Triple Helix are identified (see Figure 2: Triple Helix modes I-III). In a Triple Helix I network, industry as well as HE are steered by the public authority. Characteristic for this mode are clearly defined boundaries between industry, research/HE and the government represented by the maintenance of their traditional roles. Here, the government's role is the provision of funding in order to support start-ups and the realization of expensive projects. The actors in the Triple Helix II network are distinguished regarding their clear boundaries, too. However, industry, research and government are independent spheres which are only linked one with the other. Lastly, Triple Helix III networks are defined by an extension of functions of the actors (Etzkowitz & Ranga, 2010, pp. 4-5). These extensions of function occur specifically in form of (Viale & Ghiglione, 1998, p. 3):

- the creation of spin-offs by researchers at HE institutes,
- the employment of researchers from the public sector in the private sector,
- the employment of self-employed and entrepreneurs in research institutes or HE transfer offices, and

- the management of public research projects by academic and private researchers.

This mode of Triple Helix III describes well the network infrastructure which the EU Member States seek to realize (Etzkowitz & Leydesdorff, 2000, p. 112). Here, the national governments play an important role regarding the implementation and maintenance of Triple Helix partnerships by ensuring the partners' commitment to the network. Particularly, this is true in terms of communication and knowledge transfer. Furthermore, the Triple Helix model emphasizes the importance of international linkages. In that regard, the concept of multi-level governance in the EU is of considerable relevance and therefore, lies in the focus of the following section.

(2.2) MULTI-LEVEL GOVERNANCE

As it has been outlined previously, the overall European innovation performance is determined on at least two levels, the national and the European, supplemented by local and regional levels. In the case of the EIT ICT Labs and the Software Campus, there are actors of the EU and the national level involved. Hence, their co-ordination and collaboration needs to be addressed in the following.

The current situation of innovation policies in Europe can best be described by Kuhlman's concept of 'shared responsibilities' (Kuhlmann, 2001, p. 966). This concept is based on the multi-level governance concept which is characterized by decentralization, delegation and subsidiarity. By decentralization is meant that the main activities in this policy field are performed on a national respectively sub-national level so that the Member States and federal states for instance are the important actors in steering research activities. The second term delegation describes the transfer of certain competencies away from the national to the European level. (van Kersbergen & van Warden, 2004, p. 153) Thirdly, the concept of subsidiarity laid down in Article 5 (3) Treaty on European Union is the principle determining on which level – national or supranational – policy actions are taken. It defines that policies are always first to be pursued on a national level. Only in case that addressing a problem on the European level is more efficient than addressing it on the national level, the EU gets active in the policy process. In terms of innovation policy, this principle of shared competencies is for instance shown by the launching of European strategies like the Lisbon Agenda and of national strategies in the different Member States.

'Governance' within the concept of multi-level governance, needs to be clearly distinguished from 'government'. 'Government' is concerned with the infrastructure including formal structures as well as the net of institutions which enable public authority to address the interests and needs of the society (Dolinar, 2010, p. 99). However, in the EU – and especially in the area of HE – there have been trends away from the government towards governance (Mayntz, 1998; van Kersbergen & van Warden, 2004). In general, 'governance' can be defined as 'the continuous political process of setting explicit goals for society and intervening in it in order to achieve these goals' (Jachtenfuchs & Kohler-Koch, 2004, p. 99). This definition of governance is very broad in contrast to what Papadopoulos states by referring to a 'sustaining co-ordination and coherence among a wide variety of actors with different purposes and objectives' (Papadopoulos, 2008, p. 31). De Boer, Enders and Leisyte (2007) identify such governance in the field of the HE by the fact that the co-ordination of this system is steered by various actors of interdependent policy levels at the stages of the policy cycle from agenda setting to policy evaluation. Thus, the sector of HE particularly illustrates that governance depends on the action taking of several actors at several territorial and functional levels.

In general, the term 'multi-level' is referred to the fact that governance includes 'a large number of decision-making arenas differentiated along functional and territorial lines and interlinked in non-hierarchical way' (Papadopoulos, 2008). In the EU these levels are local, regional, national and supranational. Thus, the EU's policy setting, making and implementation within the concept of multi-level governance consists of 'a system of continuous negotiation among nested governments at several territorial tiers' (Marks, 1993, p. 392). Consequently, the existence of a specific number of levels induces a certain degree of (de-)centralization (Conzelmann, 2008). Decentralization occurs because of policy-making pursued on the subnational level. Thus, actors like federal states, communities, or local authorities are involved in decision-making besides the national institutions. Moreover, the national government is not anymore considered to be the highest level of policy making since there is a delegation of powers to the supranational solving a European wide problem seems to be more appropriate and efficient when it is done at the EU level. The European policies are therefore more seen as 'political initiatives to tackle with the coordination of European and national policies' (Magalhaes, Veiga, Ribero, Sousa, & Santiago, 2012).

In addition, co-ordination is needed among actors of different horizontal levels – meaning actors of different sectors. Hence, this involvement of actors of different horizontal levels leads to changes in the policy areas linked to innovation. Gornitzka (2010) for instance shows that the trends of governance in the HE were reinforced by new developments in fields such as innovation and research. This view is supported by van Kersbergen and Verbeek (2004, p. 149) who outline the five sources of change in the diverse policy arenas of the EU:

- a changing political concept,
- a rise in the number of actors,
- the action-taking by the European Commission,
- the ruling of the European Court of Justice, and
- the intervention of Member States.

The Member States' governments build a core element in the EU since the implementation of multi-level governance depends on their action taking (Dolinar, 2010, p. 99). In order to be able to coordinate the activities of national governments and the EU, a pool of instruments is available to the policy actors. The selection of concrete means depends on certain conditions such as (Rosenbaum, 2010, p. 287):

- the features of the policy system,
- the needs of the group the policy is addressed to, and
- the actor intending to use the policy instrument.

In the EU, the actors using policy instruments are supposed to be interdependent. According to Hanf and O'Toole (2003, p. 5), it results in disturbances which mostly occur on the EU level and affect especially the working of nationally implemented networks.

This leads to the question which policy instruments can be used in the EU. For this purpose, the following section deals with the diversity of policy tools which are available to policy actors in the multi-level governance.

(2.3) POLICY INSTRUMENTS

Vedung (1998, p. 21) defines policy instruments as 'the set of techniques by which government authorities wield their power in attempting to ensure support and effect social change'. So, policy instruments describe the ways in which the German Government can influence the policy making of and the outputs of the EIT, the EIT ICT

Labs and the Software Campus. The categorization of these instruments depends on the author. However, there are three dominant dimensions (see also Table 3: Policy instruments in higher education and innovation policy):

- legislation,
- funding
- information.

Legislative tools are commonly defined as rules steering and regulating interactions between actors in different arenas such as society and market. In order to construct framework conditions for the social and economic life in its territory, the government uses regulations, laws and directives. The legislative instruments might also include self-regulation, standard setting, delegated regulation as well as advisory services and the implementation of committees. To sum it up, the acts provide the legal basis for governmental action which is aimed at achieving previously defined goals. (Borrás, 2013; Bähr, 2010; Hood, 1984)

Another category of policy instruments concerns financial tools focussing and affecting the market. These are allocation of financial resources or as (dis-)incentives. The incentives and disincentives are meant to indirectly steer the market for instance through changes in the taxation system. According to Bähr (2010), the financial tools are charges, taxes and subsidies. Moreover, Hood (1984) adds grants, loans and user charges to this category of policy instruments. (Bähr, 2010; Borrás, 2013; Hood, 1984)

The last dimension of policy instruments refers to the collection of information and its voluntary exchange. According to Bähr (2010, p. 18), the major aim when using these instruments is to convince the recipients of particular information. In that way, those members of society are reached who are not addressed and influenced by other binding means. Reaching these members is further facilitated by their formal or informal relationships to the political actors, either through contracts, common institutions or through public and private partnerships. Here, the linked partners provide and exchange information in diverse ways ranging from benchmarking and peer pressure, recommendations, campaigns, codes of conduct to advertising, institutions, and advice. (Borrás, 2013; Bähr, 2010; Howlett, 2000; Lascoumes & Les Gales, 2007; Hood, 1984; Kuhlmann, 2001)

The basis for the information instrument is raw data or original databases. In that regard, the actors engaged in the communication process are characterized as data pro-

viders, data brokers, and data users. The information providers are actors with strong ambition to publish data but who want to maintain control over the data. In contrast, data users aim at obtaining as much information as possible for a price which is as low as possible. Lastly, the data broker functions as an intermediary between provider and user and has to ensure the well-functioning of exchange by reducing barriers such as caution. (Walker & Taylor, 1999, p. 4)

According to what the literature suggests, it could be expected, that the German Government primarily performs the role of the data broker mediating between actors of different levels. Referring to the first sub-question this means that the Federal Government embedded in the concept of multi-level governance of the EU translates the European innovation strategy into the national strategy. By doing so, the government is supposed to contribute to the European performance in terms of commercialization of knowledge. This expectation leads to preliminary assumptions on the second sub-question referring to the ways in which the Federal Government can contribute to the commercialization of knowledge in the EIT. Here, it is assumed that the German Government uses different policy instruments out of the pool of diverse instruments to ensure the well-working of the EIT and the commitment of the EIT network partners to their engagement in the European institute. So, the working of the EIT is affected by the Federal Government's use of legislative, financial and the information. Finally, it is expected that the information instrument is intensively used by the Federal Government to implement and maintain the Triple Helix network. In that regard, it is assumed that the Federal Government mediates between the partners of the networks what leads to an accelerated commercialization of knowledge. Characteristic for the information instruments used within the Software Campus to accelerate the knowledge commercialization is the diversity of meetings where different perspectives of the network partners are turned into the beneficial consideration of one research issue from different angles.

In order to empirically find out what the role of the German Government in the EIT ICT Labs is, a qualitative research based on a case study is pursued. The methodological considerations determining the data collection and analysis are addressed in the upcoming chapter.

(3) METHODOLOGICAL FRAMEWORK

In the upcoming methodology chapter the operationalization of the main variables is outlined, followed by the description of the research design, case selection as well as data collection and analysis. The presented methodological choices describe the way in which the answer to the main research question of the study, that is, identifying the national government's role in a European initiative, is gained (see Figure 3: Research process).

(3.1) OPERATIONALIZATION

In order to be able to answer the research question of this thesis, the main variables of the study need to be identified based on the theoretical framework of Triple Helix, multi-level governance and policy instruments presented in chapter 3. The operationalization of the concepts is presented in the following table:

Table 1: Conceptual concepts, their operationalization and indicators

concepts	Operationalization		Indicator
Multi-level governance	subsidiarity principle within the Software Campus	address problems arising European wide	identification of the same challenges to be tackled in the agenda of the Software Campus and the EIT
		reaching the critical mass of human resources across all EU Member States	▪ number of students in the Software Campus ▪ number of non-German students in the Software Campus
		implementation of community policy	convergence of goals and concepts of the EIT and the Software Campus strategy
Policy instruments used in the EIT	mechanisms on the EIT level	Member States' contribution to the EIT	▪ Informal Meeting of Ministers for Competitiveness organized by the German Government ▪ laws adopted by and ▪ subsidies provided by the national governments to influence the EIT

	mechanisms on the KIC level	Member States' contribution to the KICs	▪ financial subsidies for the KICs provided by, ▪ financial subsidies for the program Software Campus provided by and ▪ the best practice policy instrument used by the national governments
Conditions for communication	types of places for communication in the Software Campus	places for the exchange of policy information	the National IT Summit as a meeting of industry, research/HE and government for organizational and administrative matters of the Software Campus
		places for the exchange of knowledge	▪ mentoring and ▪ leadership trainings as meetings of industry and research within the Software Campus for thematic exchange
	different perspectives of actors of the Software Campus	motivation of the actors to engage in the Software Campus	relevance of ▪ the students' education provided by the Software Campus, ▪ the network of industry, research, HE and government for industry, students, universities and research institutes as well as the BMBF engaged in the Software Campus
		goals envisaged by the actors of the Software Campus	aim to ▪ recruit skilled labour force or/and ▪ extend existing networks stated by industry, the students of the Software Campus and the BMBF

MULTI-LEVEL GOVERNANCE

As it is outlined in chapter 3 on the theoretical framework, the EU innovation policy is embedded in the concept of multi-level governance. According to Kuhlmann (2001, p. 966), the EU is a policy arena of 'shared responsibilities' where the principle of subsidiarity is of considerable relevance (Magalhaes et al., 2012, p. 98).

SUBSIDIARITY PRINCIPLE WITHIN THE CONTEXT OF THE SOFTWARE CAMPUS

Subsidiarity, as laid down in Article 5 (3) in the Treaty on European Union, is considered a normative concept which is aimed at organizing the share of competencies among actors of different levels (Bermann, 1994; Pelkmans, 2006; Schütze, 2009). It is based on three criteria (Kuhlmann, 2001, p. 963):

(a) Address problems arising European wide

First, Kuhlmann (2001, p. 963) states that subsidiarity means to address challenges occurring European wide. Thus, it is looked at which challenges shall be tackled by the program Software Campus. Then, it needs to be outlined how far these problems occur on the European level. The logic behind this is that a coherence of the national and EU innovation strategies can only be achieved when the same societal and economic difficulties are identified and addressed by policy actions on both levels. Addressing a European wide problem is indicated by analysing whether the Software Campus and the EIT both identify the lack of skilled labour force responsible for taking go- or kill-decisions on new ideas.

(b) Reaching the critical mass of human resources across all EU Member States

Second, it is stated that projects based on the subsidiarity principle should increase the amount of personnel resources within the territory of the EU (Kuhlmann, 2001, p. 963). Whether a critical mass is efficiently reached in order to have an impact on the innovation performance on the EU level strongly depends on serving either international or local markets (Marimon & Carvalho, 2008, p. 4). This leads to the need to study in more detail the target group of the Software Campus. Therefore, it is first looked at the total number of students admitted to the program. Second, the origin of these students is focussed indicating the share of non-German students. The higher the share of these non-German students, the more probable it is to provoke impacts on the European level with the Software Campus program.

(c) Implementation of EU policy

Alternatively, subsidiary projects should facilitate the realization of policy decisions taken on the EU level since the multi-level governance depends on the action taking of national governments (Dolinar, 2010, p. 99). So, it is outlined whether the Software Campus strategy mirrors the EIT agenda. This is indicated by comparing goals,

primary concepts, concretely the knowledge triangle, and the role of the industry as it is defined in both strategies. If the Software Campus program identifies the same goals and concepts like the EIT agenda, it is assumed that Germany implements the EU innovation policy.

POLICY INSTRUMENTS USED IN THE EIT

As Hanf and O'Toole (2003, p. 3) suggest, the selection of policy instrument depends on the actor and on which level – national or European – the policy making takes place. Since the EIT integrates the KICs as sub dimensions, a distinction between instruments available within the EIT and within the KICs is needed.

MECHANISMS USED ON THE EIT LEVEL

(a) Member States' contribution to the EIT

On the level of the EIT, the Member States might make use of diverse policy instruments. The analysis of a selection of these mechanisms starts with the information instrument. As Bähr (2010, p. 18) defines these instruments, the German Government uses them to convince other Member States of its ideas. The author's definition suggests that the Federal Government can influence the future innovation performance of the EIT especially during the implementation of the EIT. Therefore, the Informal Meeting of Ministers of Competitiveness exemplarily indicates the use of the information instrument by the German Government. The use of legislative instruments in indicated by laws the German Government might adopt to contribute to the EIT. Lastly, financial instruments include financial subsidies allocated by the Federal Government in order to financially support the operation of the EIT.

MECHANISMS USED ON THE KIC LEVEL

(a) Member States' contribution to the KICs

The KICs are the executing bodies of the EIT, responsible for the implementation and operation of single projects, which target the promotion of knowledge commercialization (Colombo et al., 2008, p. 3). In order to facilitate this operation of projects, they maintain Co-location Centres in different Member States, so that the Member States' governments contribute to the KICs by using policy instruments. The policy instruments analysed in the section on the Member States' contribution to the KICs are the financial subsidies allocated to the KICs as well as to the projects of the KICs by the

German Government. The first subsidies include the contribution of the national governments for the operation of the KICs. The latter include the allocation of financial resources to the program Software Campus. In addition, it is analysed if and how the best practice policy instrument is used. In contrast, legislative policy tools are not examined in this section since the importance of legislative tools used by the German Government seem less important to due to the independence of the EIT and KICs from national legislation.

CONDITIONS FOR COMMUNICATION IN THE EIT ICT LABS

According to Etzkowitz and Leydesdorff (1998), the communication processes between industry, research, HE and the government are of considerable importance since they provide the basis for knowledge exchange and accelerate the knowledge commercialization. In the following this communication process is operationalized in order to outline how communication takes place within the Software Campus.

TYPES OF PLACES FOR COMMUNICATION IN THE SOFTWARE CAMPUS

(a) Places for exchange of policy information

Etzkowitz and Leydesdorff (1997, p. 160) state that the government's role in the Triple Helix model is to use mutual learning within the network in order to promote the exchange of ideas on how to improve the knowledge capitalization. Therefore, opportunities for such a mutual exchange and/or best practises have to be available. These opportunities are supposed to be provided by meetings of the BMBF and the partners of industry, research and HE of the Software Campus. During these regular and irregular meetings, the implementation and operation of the Software Campus shall be discussed and brought forward. The important meeting focussed here is the National IT Summit organized by the German Government. So, the National IT Summit is used to indicate the places for exchange of policy information between all actors of the Triple Helix network.

(b) Places for the exchange of knowledge

Furthermore, opportunities for knowledge exchange between industry, research, HE and the government are of considerable relevance. These opportunities for transfer of knowledge mirror one of the reciprocal linkages between industry, research, HE and the government which are relevant for the commercialization of knowledge (Etzkowitz & Leydesdorff, 1997, p. 159). These possibilities can be provided at meetings or

through institutions of the industry and representatives of research – respectively the students enrolled in the Software Campus. These meetings are supposed to be used for the exchange of knowledge gained through research and the teaching of skills to the students by the industry. These places are indicated by the mentoring and leadership trainings provided to the students by the industry partners of the Software Campus.

DIFFERENT PERSPECTIVES OF ACTORS OF THE SOFTWARE CAMPUS

The exchange of views from various sectors is meaningful to the innovation process. According to Leydesdorff and Etzkowitz (1998), differences in the perspectives on innovation projects affect the efficiency of their communication due to a more dynamic exchange of information between industry, government and research. In the context of this research these different perspectives are operationalized as motivation and goals for the involvement in the Software Campus.

(a) Motivation of actors to engage in the Software Campus

First, the different perspectives of the actors involved in the Software Campus refer to different motivations to get engaged in this program. In that regard, it is focussed on the reasons for the students, industrial partners, the research, HE institutes and the government to participate in the Software Campus. The motivation can either be provided by the education offered to participating students through the HE and research institutes, by the established relationship between industry and research or finally, by financial advantages for the partners of the Software Campus like the share of investments in research activities.

(b) Goals envisaged by the actors of the Software Campus

Second, it is outlined what the network partners of the Software Campus expect of their engagement in the program Software Campus. Hence, a closer look is taken at the expectations of industry, the students in their function of researchers and the BMBF. These goals include the quality of education of the Software Campus students as well as the extension and strengthening of the network.

(3.2) RESEARCH METHODOLOGY

Based on the operationalization just presented, data is collected and analysed by means of a single case study of the program Software Campus (Yin, 2009, p. 4). For the purpose of thoroughly conducting the analysis, this qualitative study uses multiple data

sources. Before presenting the collection and analysis of these data, the choice of the research design and an argumentation on the case selection is presented.

RESEARCH DESIGN

The objective of this research is to outline the role of the German Government in the EIT ICT Labs. An answer on this research question is gained by the help of the research design of a case study which Yin defines as 'an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context' (Yin, 2009, p. 18). Moreover, this research is an exploratory study based on qualitative methods such as qualitative interviews and document studies. For the analysis, the single unit studied is the Software Campus as a program of the EIT ICT Labs. Upfront, the case selection criteria were developed to ensure that the case well represents the EIT ICT Labs and to guarantee access to the required data (Yin, 2009, p. 47). The reasons for the selection of the Software Campus are further outlined in the following paragraph on the case selection.

CASE SELECTION

As Yin (2009, pp. 19-20) states, the case has to be selected according to the research question and shall help to explain, describe, illustrate, and enlighten the role of the Federal Government in the EIT ICT Labs. Thus, the selection of an appropriate case is based on the theoretical framework which is presented in chapter 2. The Software Campus is a program integrated in the EIT ICT Labs and is selected as a case for a couple of reasons. Firstly, the Software Campus brings together nine business partners, five universities, three research institutes and the Federal Government represented by the BMBF. Together, the actors support Master and PhD students of computer science or related studies in their research activities as well as to provide them with entrepreneurial skills. Hence, the Software Campus as an 'outstanding project' (EIT ICT Labs, 2011) of the EIT ICT Labs node in Berlin (EIT ICT Labs Germany) applies the knowledge triangle promoted by the EIT. This concept is further extended by integrating the German Government in the network of the Software Campus. Thus, the Software Campus appropriately represents the model of Triple Helix by bringing together industry, research and HE as well as government. Moreover, the involvement of the German Government in a program embedded in an EU innovation initiative will give evidence on the multilevel governance concept within the EIT ICT Labs.

DATA COLLECTION

This research is based on data of primary sources (see Table 4: Primary data sources according the dimensions) and secondary sources. In order to be able to cross-check and triangulate this data, multiple – according to Yin (2009, p. 114), multiple means at least two – data sources are used. These are qualitative interviews, press releases, speeches, audio-visual data and documentation. The following Table 2: Observation matrix referring to sub-questions I to III presents which data sources are used to answer the three research questions. The columns indicate which research question shall be answered whereas the rows refer to the aforementioned operationalization. For the purpose of keeping the table as simple as possible, the fields are subdivided enabling to represent by 'x' which kind of source is used for which research question referring to a certain operationalized dimension. The documentations as presented in a detailed manner in Table 4: Primary data sources according the dimensions are summarized to four major categories.

Table 2: Observation matrix referring to sub-questions I to III

legend:

Documentation:	EU regulation	EIT documents	documents published by the BMWi	reports on the National IT Summit, other
Other sources than documentation:	interviews $(I_a\text{-}I_d)$	press releases $(P_a\text{-}P_g)$	speeches $(S_a\text{-}S_c)$	videos $(V_a\text{-}V_h)$

			SQ I				SQ II				SQ III			
Multi-level governance	the subsidiarity principle	address problems arising European wide		x	x	x								
			x	x	x									
		critical mass of human resources across all			x	x								
			x	x	x									
		implementation of EU policy	x	x	x	x								
			x	x										
Policy Instruments used in the	mechanisms used on the EIT level	Member States' contribution to the EIT	x	x	x		x	x	x					

Conditions for communication			C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
	mechanisms used on the KIC level	Member States' contribution to the KIC	x	x	x	x	x	x	x	x				
			x	x			x	x						
	types of places for communication	places for the exchange of policy information							x	x			x	x
							x	x			x	x		
		places for the exchange of knowledge											x	x
											x	x		
	different perspectives of the actors of the Software Campus	motivation to engage in the Software Campus												x
											x	x		x
		goals envisaged by the actors of the Software Campus												
											x	x	x	x

The documentation includes publications of German and European actors. First, they encompass agreements and reports published by Research Union and the German Government - respectively the Federal Ministry of Economics and Technology (BMWi) – declaring the results of the National IT Summits 2010, 2011 and 2012. Second, documentation in form of reports published by the EIT and EIT ICT Labs is analysed. These include annual reports of the EIT and the EIT Strategic Innovation Agenda (EIT SIA) as well as the EU Regulation establishing the EIT.

Interviews are chosen as suitable source of evidence because they can be systemically used to induce the interviewee by specific questions to provide verbal answers to the matter of interest (Scheuch, 1967, p. 138). The specific reason for relying on qualitative interviews is the possibility to reveal new aspects of a phenomenon, unintended explanations for a problem and/or to identify where different interviewees put their emphasis (Weischer, 2007, p. 261). In that context, the study uses semi-structured interviews based on the theoretical framework and the information lacking which is identified by the help of Table 2: Observation matrix referring to sub-questions I to III. In order to triangulate the interview information, a cross section of stakeholders in the Software Campus was contacted. Finally, one person of the management of the Software Campus and three participating students agreed to respond. Since the interviewees

of the two groups can provide different insights, because they are involved in the Software Campus in different ways, two types of interview protocols were developed (see Attachment I – Interview guideline: the Software Campus management and Attachment II – Interview guideline: the Software Campus students).

The third source of information is videos published by the Software Campus which are available on the website of Youtube (https://www.youtube.com/). They include visual recordings of network partners representing the industry. The videos are short interviews and present the motivation and goals for the industry's engagement in the Software Campus. Moreover, these videos provide information on the goals the several business partners want to achieve by their engagement in the Software Campus.

DATA ANALYSIS

The analysis of the interviews (I_a-I_d) is conducted in four phases identified by Lamnek (2010). First, the interviews are recorded and transcribed. Secondly, this reproduction in written form enables to pursue individual analysis of each interview. In this step the most important paragraphs are identified in order to obtain the key information. In the third phase of generalizing analysis, commonalities and differences in the interviews are specified. Finally, there is the step of self-control where the outlined information is rechecked. Through a first review of the transcribed interviews, categories are identified which subsequently allow to organize the information provided by the interviewees along the matters of interest.

Concerning the press releases (P_a-P_g) and the audio-visual data (V_a-V_h) the approach of content analysis is pursued. The content analysis is 'a research technique for making replicable and valid inferences from texts (or other meaningful matters) to the context of their use' (Krippendorf, 2004, p. 18) and which is aimed at 'making inferences by objectively and systematically identifying specified characteristics of messages' (Holsti, 1968, p. 14). By the term 'objectivity' the author refers to the possibility to obtain the same results when imitating the process of codification. In contrast, 'systemic' describes the fact that the codification has to be made clear upfront. (Holsti, 1968, p. 14) This implies that it has to be determined a priori which information has to be analysed. For the analysis of the press releases, the dimensions of the information needed concern the target group of the Software Campus, the financial subsidies provided by the BMBF and the types of places for communication as well as the perspectives of the diverse actors involved in the Software Campus. For the audio-visual data, the categori-

zation shall help to outline the relevant information on the motivation to engage in the Software Campus, the expectations of this engagement as well as the emphasized network partner.

The documentation like the Regulation on the implementation of the EIT, the EIT Strategic Innovation Agenda and reports of the National IT Summit from 2010 to 2012 is studied by conducting the content analysis. Here, a reduction process is based on the analysis of key paragraphs since these publications are often about the general German innovation strategy where the subject of interest is only mentioned in a chapter or paragraph. (Weischer, 2007, pp. 331-332)

The use of multiple sources of information enables to fill the gaps of understanding of data retrieved from one source by triangulating it with data from the other primary sources as well as with secondary literature. In the case that any disparities arouse further verification of the data was pursued. The aim of triangulation is to look at matters of interest from different angles and thus, to confirm the different findings (Yin, 2009, p. 115).

(4) CASE STUDY

This chapter presents the information provided by the diverse data sources. First, it is outlined how the Software Campus is embedded in the concept of multi-level governance in the EU. Here, it is analysed whether a European wide problem is addressed, whether a critical mass of human resources on the EU level is reached as well as to what extent the agenda of the Software Campus correlates with the EIT strategy. Second, the analysis focusses on the policy instruments the Federal Government uses on the EIT and the KIC level to influence the EIT's operation and outcomes. Third, the types of places for communication concerning the operation of the Software Campus and places for the knowledge exchange among the network partners are focussed. It is complemented by the analysis of the probable differences in motivations and goals for the partners' engagement in the Software.

(4.1) MULTI-LEVEL GOVERNANCE

SUBSIDIARITY PRINCIPLE WITHIN THE CONTEXT OF THE SOFTWARE CAMPUS

(a) Address problems arising European wide

The ICT sector, identified as one key innovation driver by the Software Campus and the EIT, is characterized by fast changing trends on the national as well as on the European level (I_a, BMWi$_{2011}$;BMWi$_{2012}$; Kalisz & Aluchna, 2012). Moreover, the ICT steadily penetrates other sectors such as logistics and energy and thus, influences the overall innovation performance (I_a; BMWi$_{2011}$; BMWi$_{2012}$; IT Summit$_{2010}$; IT Summit$_{2011}$). This development leads to the need for labour force to have profound skills in ICT and entrepreneurship skills which prepare it to take leadership positions in IT businesses (I_a; P_d-P_g; S_b; S_c; IT Summit$_{2011}$). In these positions the labour force is expected to judge new ideas by making go- or kill-decisions for innovations (I_a). On the European level this problem of lacking skilled labour force is identified as a too low degree of students' and researchers' mobility between industry and HE and research institutions (Rohrbeck & Pirelli, 2010). In that regard, the major problem the EIT sees the missing entrepreneurial mind of students which would increase their innovativeness and creativity (EIT$_{2011}$).

(b) Reaching the critical mass of human resources across all EU Member States

The challenge of shortage of labour force with explicit leadership skills which the EU faces is for instance solved by training the young generation of researchers and providing them with entrepreneurial competencies. Therefore, the target group of the Software Campus is Master and PhD students of computer science or related studies (P_b; P_c; P_e; P_g; $BMWi_{2010}$; $BMWi_{2012}$; IT Summit$_{2011}$). The number of students enrolled in the program is steadily rising from eleven students admitted in the pilot phase in 2011, to 80 students in 2012 and finally, to 100 participating students in 2013 (P_a; P_c; P_e-P_g; $BMWi_{2012}$; IT Summit$_{2011}$). As the subsidiarity concept defines, these students should come from different Member States in the EU. Still, until now there are only few non-German students enrolled in the program of the Software Campus due to the challenge of high organisational and administrative hurdles they face (I_a; $BMWi_{2011}$). Nonetheless, European and other international students are 'in general, as much welcomed' (I_a) as German students. In the long run, they shall even represent up to 50% of the participating students (I_a; IT Summit$_{2011}$). Still, the main problem is that the allocation of subsidies by the BMBF is tied to a cooperation contract between the actors of industry, research and HE as well as the EIT ICT Labs Germany GmbH which ensures their lasting commitment to the program (I_a; P_b; IT Summit$_{2011}$). Hence, the grants can only be offered to students who are enrolled in one of the eight contracting partners of research and HE institutes located in Germany (I_a; P_b).

(c) Implementation of community policy

The primary goal stated in the EIT SIA is to enhance the implementation of new ideas and businesses as well as to improve the qualification of students and labour force (EIT SIA). Here, particular stress is laid on an entrepreneurial education in order to complement the theoretical knowledge with leadership skills (EIT SIA; Rohrbeck & Pirelli, 2010; Kalisz & Aluchna, 2012). The Software Campus is intended to satisfy this need as well by combining academic education and practical work – what is seen as the outstanding characteristic of the Software Campus (I_a; $BMWi_{2010}$; $BMWi_{2011}$).

This co-operation of industry, research and HE well exemplifies the approach of the knowledge triangle promoted by the EIT (Rohrbeck & Pirelli, 2010; Didier, 2010; EIT SIA; EIT Reg). The creation and maintenance of these partnerships are supported by the provision of funds to the EIT's sub dimensions KICs which apply the principle of the knowledge triangle because it is assumed that more close linkages between guarantee the aforementioned broadly oriented education of skilled workers (EIT SIA). There-

fore, the industry shall become an integral part of the education of researchers by providing educational activities and trainings (Colombo et al., 2008). Also the Software Campus is characterized as an initiative bringing together partners of HE, research and industry, whereas the latter provides opportunities of leadership training and mentoring activities (I_a-I_d; P_b-P_d; P_g,; IT Summit$_{2011}$). Thus, the industry in the EIT and the Software Campus is more than a mere funding agency (Didier, 2010).

The industry's financial contribution remains particularly important for subsidizing the training of students at HE and research institutes. Hence, the KIC partners of the industry sector contribute from 20% to 31% of the overall budget for each KIC compared to 21.5% (€ 167.4 million) allocated throughEIT grants (EIT$_{2012}$; EIT SIA). In the case of the Software Campus, the business partners represent a key source of financing, too. Here, they contribute half of the annual budget of the program of € 10.0 million (IT Summit$_{2011}$).

Moreover, the EIT documents emphasize the promotion of mobility of students and researchers including sectoral mobility between HE and industry particularly through educational programs (EIT Reg; EIT$_{2011}$). In the Software Campus this mobility shall be achieved by the integration of IT students into a network of partners of industry, HE and research which shall ensure that in the future at least 50% of the participating students become employed in leadership positions in German IT companies (I_a; IT Summit$_{2011}$).

Lastly, the EIT targets particularly SMEs because they have not been focussed in other EU initiatives such as the Sixth Framework Program (Rohrbeck & Pirelli, 2010; EIT Reg). Therefore, their inclusion in the EIT networks shall speed up the SMEs' growth rate as well as facilitate their penetration of international markets (EIT$_{2012}$). In contrast, the industry engaged in the Software Campus consists of large and multi-national companies. The fact that these multi-national businesses are amongst the founding fathers of the Software Campus, implies that newly joining industry partners are preferably large companies, too (I_a; EIT ICT Labs Germany GmbH, 2013). In that way, a similar strength of the industry partners in the Software Campus shall be ensured.

All in all, the EIT and the Software Campus are only different in terms of size of industry focussed. Still, both, the EIT and the Software Campus, aim at improving the entrepreneurial education of students in order to tackle the commonly identified prob-

lem of highly skilled labour force taking go- or kill-decisions on innovative ideas. Nevertheless, Germany cannot reach a critical mass of students across all Member States what limits the achievements of the goal on the EU level. Still, both rely on the same approaches how the stated goal shall be attained. In that regard, it seems that Germany seems to be able to solve a European problem by actions on the national level.

(4.2) POLICY INSTRUMENTS USED TO CONTRIBUTE TO THE EIT

MECHANISMS USED ON THE EIT LEVEL

(a) Member States' contribution to the EIT

Already in the creation of the EIT, the German Government contributed to the European institute. For the first half of the year in 2007, the German Government had held the Presidency of the Council of the EU and made the EIT one of the key priorities for this time period (Daimer, Edler, & Howells, 2011, p. 15). For the purpose of negotiating the design of the EIT and of pushing through as many national interests as possible, the Federal Government organized conferences and informal meetings. One of the most important meetings was the Informal Meeting of Ministers for Competitiveness in April 2007 (German Presidency of the European Union, 2007). This ministerial meeting provided the basis for a further formal meeting where an important compromise text was conducted. In the first sight, this text presented the Member States' opinion on a draft of the European Commission on the EIT (Competitiveness Council, 2007). In order to find the compromises, this informal meeting organized by the German Government was of considerable importance.

Art. 9 (1) of the Regulation on the implementation of the EIT passed by the European Parliament and the Council defines that the institute 'shall carry out its activities independently of national authorities' (EIT Reg). Despite this independence, the national governments can nonetheless pass national legislation affecting the EIT's operation and performance in the Member States. In that context, the Member States influence the acceptance and operation of its institution through policy making particularly in the HE sector (EIT Reg). One appropriate example for such a national government policy contribution concerns the regulation of recognition of diplomas which the EIT together with its partner universities award (Didier, 2010).

Additionally, the Regulation on the implementation of EIT grants to the national governments the possibility to financially contribute to the EIT (EIT Reg). Hence, the

host Member States in total contributed € 1.56 million (1.98%) to the budget of the EIT in 2012. In 2013, the absolute contribution remains stable and represents a share of only 1.38% of the total EIT budget (EIT$_{2013}$).

In conclusion, the German Government primarily contributes financially to the EIT. However, the Federal Government can also influence the operational entities of the EIT. Thus, the following section analyses the national governments' contribution to the KIC through financial and information instruments.

MECHANISMS USED ON THE KIC LEVEL

(a) Member States' contribution to the KICs

The practical realization of the EIT's activities is pursued by the entities of the KICs as the executing operational bodies of the EIT (EIT Reg; Didier, 2010). The KICs in general are networks composed of at least three partners of industry, research and/or HE from two or more Member States as well as public authorities (EIT Reg; EIT$_{2012}$).

To support the KICs in their operational work the Member States make notable use of the financial instrument what contributes to the diversity of funding sources which needs to be assured by the KICs (EIT Reg). All together, the national governments contribute 21.5% to the KICs' overall budget (EIT$_{2012}$). In addition, funds are also allocated to the KICs' concrete programs. For the Software Campus a financial support of € 5 million is granted by the BMBF and remunerates the managerial tasks fulfilled by the EIT ICT Labs Germany related to running the Software Campus (I$_a$; IT Summit$_{2011}$; BMWi$_{2010}$). Furthermore, the BMBF provides financial subsidies of € 100.000 for each participating student (P$_b$; P$_d$; P$_g$).

Moreover, the national governments are involved in the exchange of best practices where for instance successful KIC projects are presented which shall encourage other Member States to integrate these or similar concepts into their national innovation policy (I$_a$; EIT Reg). The program Software Campus is one of those best practice examples which shall be transferred from Germany to other Member States through the centralized infrastructure on the European level (Colombo et al., 2008). According to information provided in the interview with the manager of the Software Campus efforts are made to transfer the conceptual framework of the Software Campus via the EIT ICT Labs Germany GmbH to other Member States. At the moment, 'we [the EIT ICT Labs

Germany GmbH] talk to colleagues from Finland' (I_a) and the institute pursues small projects in order to promote a first share of expertise (I_a).

To sum it up, the German Government uses particularly the financial instrument to subsidize projects run by the KICs such as funding the Software Campus as a program of the EIT ICT Labs. More in detail, the German Government contributes 50% of the overall budget of the program Software Campus and supports each research project conducted by the enrolled students. Secondly, the information tool in form of the best practice tool is used to transfer the program of the Software Campus to other Member States. The information tool is also used in different ways on the program's level. The following section analyses this use of the information instrument in the Software Campus.

(4.3) CONDITIONS FOR COMMUNICATION

TYPES OF PLACES FOR COMMUNICATION IN THE SOFTWARE CAMPUS

(a) Places for the exchange of policy information

The idea of the program Software Campus was born during the German National IT Summit which is a congress aimed at strengthening Germany as an important IT place (I_a; S_a-S_c; IT Summit$_{2010}$). This National IT Summit was particularly important during the creation process of the Software Campus because it unified and unifies the founding members of research, HE, industry as well as the Government. As Table 5: Composition of working group 6 of the National IT Summit shows, a majority of founding members of the Software Campus were and still are brought together in the working group 'Education and Research for the Digital Future' which is co-steered by the BMBF. An important role concerning the moderation of the creation process was played by the BMBF who guided the process of idea exchange during the creation of the Software Campus, for instance by expecting the presentation of progress to set deadlines (I_a, S_c). The management of the Software Campus summarizes the role of the BMBF within the context of the National IT Summit as follows: 'So, in the early stage [of the Software Campus], the support was very important, I think.' (I_a). This meaning of the BMBF and especially of the National IT Summit remains high in the phase of operation of the Software Campus. Nowadays, the National IT Summit is still an important forum for dialogue since the relevant working group keeps concerned with the situation of the Software Campus is still in operation (I_a; BMWi$_{2010}$; Welfens, 2012). Furthermore, the

final agreements of the National IT Summit and the final speeches of Chancellor Angela Merkel still inform about the current state of the Software Campus (I_a; S_a-S_c; BMWi$_{2011}$; BMWi$_{2012}$).

All in all, according to the management of the Software Campus the role of the BMBF in the context of the National IT Summit as communication instrument was a very strong one in terms of ideational support (I_a). The management of the Software Campus substantiates this by saying: '[…] it is always very important to rely also on political support, so to say that you can even appeal to high channels in the industry' (I_a). Furthermore, the National IT Summit is the only event in the context of the Software Campus which brings together representatives of industry, research, HE and the Government engaged in the Software Campus (I_a). Plans for a major, internal event unifying the nine industrial, eight research partners, EIT ICT Labs Germany and the BMBF are mentioned during the interview with the Software Campus management (I_a).

Finally, the network partners mutually exchange views on operational considerations through working groups concerned with issues such as the applicant selection. Next, there are also telephone conferences with the industry partners organized by EIT ICT Labs. However, the BMBF is not committed to any of these places. (I_a)

Besides these places for policy making, the Software Campus provides different places for the exchange of knowledge which are presented in the following section.

(b) Places for the exchange of knowledge

Knowledge exchange in the Software Campus primarily takes place through two kinds of meetings between industry and students. First, there are leadership trainings where the students gain methodological, social and leadership competencies (I_a-I_d; P_c; P_d; P_g; IT Summit$_{2011}$; BMWi$_{2010}$). Up to six times a year, the students of the Software Campus attend these trainings offered by all industry partners (I_c). Here, the students are not only participating in leadership trainings of their associated industry partner but can choose from a pool of trainings at all businesses of the Software Campus. The aim of the leadership trainings is to supplement the theoretical knowledge by practical experiences and soft skills in order to make the students become the link between research and innovation (I_a; IT Summit$_{2011}$; Colombo et al., 2008).

A second opportunity for knowledge exchange is the mentoring where each student participating in the Software Campus is provided with a contact person from his or her associated industry partner (I_a-I_d; P_c; P_d-P_g; IT Summit$_{2012}$). During the interview

with one of the participants (I_b) it is emphasized that 'this mentoring is […] really exceptional because one is provided with a relatively qualified and high-ranking employee from a huge German IT business who has time to talk about future career planning once a month or every six weeks for one or two hours' (I_b). Still, it is worth noting that even though there is no clear schedule, these meetings with the mentor take place in a regular manner (I_b).

At these places at the places for policy making, the network partners might coordinate their probably diverse perspectives on the motivation and goals of their engagement in the Software Campus. Therefore, the upcoming section outlines what these motivation and goals are in more concrete terms.

DIFFERENT PERSPECTIVES OF ACTORS OF THE SOFTWARE CAMPUS

(a) Motivation to engage in the Software Campus

According to the industry's point of view, the most relevant reason to get involved in the Software Campus is the education granted to the students. The reason is that the HE and research institutions are considered to provide the program's participants with a profound theoretical knowledge base (P_f; V_a-V_d; V_h). This opens opportunities for the industry to use the network for recruiting highly skilled labour force (I_b; I_c; P_a; V_d; V_f; Rohrbeck & Pirelli, 2010). A further motivation is seen in the objective to extent the Software Campus program to the European level. In that way, the industry hopes to gain easier access to international students as well as to students who think in global dimensions (I_a; V_c; V_g; IT Summit$_{2011}$, Jofre & Dannemand Andersen, 2009).

For the participating students, the network itself and the industry as a specific network partner are of strong importance (I_a-I_d; P_g). In that context, it is explicitly outlined that these linkages of academic research with practical application of knowledge ensure the best possible realization of the student's research project (I_a; I_d; P_e; P_g). Secondly, students are motivated to apply for the Software Campus because of the knowledge exchange through mentoring and leadership trainings and through contact among the students themselves (I_b-I_d; Rohrbecker & Pirelli, 2010). Lastly, the Software Campus is attracting the students' interest because of the financial support provided by the BMBF for their research project. This financial subsidy is up to € 100.000 for a maximum of two years (I_b; I_c; P_b; P_d; P_g; Rohrbecker & Pirelli, 2010).

For universities and the research institutes, the interest might be the reputation-enhancing benefits and scientific rewards of such networks as well as the possibility to engage in research activities going beyond teaching and learning (Hagen, 2008; Winckler, 2010). These activities also supplement research with a practical and economy-oriented component (P_a). In that regard, the institutes see an assurance of quality of education through the diversified network (P_a; Jofre & Dannemand Andersen, 2009). A last motivation for HE and research institutes is the attractiveness of the program and the HE institutes to international researchers due to the latter's linkages with industry and research on a European level (P_a; IT Summit$_{2011}$; Jofre & Dannemand Andersen, 2009).

The BMBF particularly emphasizes the importance of the network of partners of industry, research and HE because it ensures a highly qualified educational program (P_a; IT Summit$_{2010}$). Concerning the role of the industry in the Software Campus, the Ministry expects the industry to contribute to the budget of the Software Campus (P_d; IT Summit$_{2010}$; IT Summit$_{2011}$). In case, the industry would not provide funds, the Federal Government would need in certain circumstances to allocate a higher share of financial resources to the Software Campus (Didier, 2010). Furthermore, the BMBF is motivated to engage in the Software Campus because the program might provoke positive impacts on the national economy through spill-over effects bringing forward the overall economic development (I_a; Rohrbeck & Pirelli, 2010).

Thus, the BMBF and the other actors present individual reasons for their engagement in the Software Campus. Still, the question remains what benefits they expect from such engagement. Hence, the following section aims at presenting the goals of industry, research and the Federal Government.

(b) Goals envisaged by the actors of the Software Campus

The main goal of the industry engaged in the Software Campus is to combine theoretical knowledge with soft and managerial skills of the students (I_a; V_a-V_c; V_i). In addition, some of the businesses involved in the program see the Software Campus as a mere recruiting event (I_b; I_c; P_f; V_d; V_f; V_h). According to statements made in the interview I_b and I_c, for instance, the Software Campus partner DATEV considers the Software Campus as a suitable source for new and skilled human resources. This is described in more detail by Rohrbeck and Pirelli who note that companies aim at gaining

new, skilled human resources, getting close contact to unique skills and using privileged channels to recruit excellent work force (Rohrbeck & Pirelli, 2010).

The primary goal of the participating students is the network extension (I_a-$_d$). In particular, this refers to the intensification of their linkages with industry (I_c-$_d$). In the future, this new or simply extended network shall improve their career opportunities and thus, facilitate their access to the markets (P_g; Rohrbeck & Pirelli, 2010).

Finally, the BMBF focusses on the output of the Software Campus in terms of an enhanced base of skilled work force in the IT sector with leadership qualifications (P_d; S_a; IT Summit$_{2010}$). In this context, it aims at ensuring a high quality education for students paving their way to leading positions in the industry (P_a). Thus, the BMBF targets the creation of new job opportunities, spill-over effects which intensify economic welfare and the increase in living quality for its citizens (Rohrbeck & Pirelli, 2010).

Hence, the Federal Government wants to improve the quality of life for the whole society like it is determined in the German Constitution. In contrast, the industry and students involved in the Software Campus target different goals like recruiting of human resources and strengthening linkages in particular to the industry. Regarding the motivation to engage in the Software Campus, there are also obvious differences among the actors of industry, HE, students and the BMBF. Finally, these diverse perspectives of the actors of the Software Campus come together during two kinds of places for information exchange. These are mentoring and leadership training providing the opportunity for the exchange of theoretical knowledge and its practical application. Albeit, the BMBF does not participate at these meetings, it played and still plays an important role during the meetings for the exchange of information on how to implement and operate the Software Campus.

This information supplemented by findings of the other sections on data analysis can now be used to provide answers to the three sub-questions and the overall research question. Thus, the upcoming chapter draws a conclusion on every sub-question followed by the last chapter on the concluding presentation of the role of the German Government in the EIT ICT Labs.

(5) CASE STUDY FINDINGS

The various findings of the case study are now used to answer the sub-questions. In that way, the drawing of a final conclusion on the role of the German Government in the EIT ICT Labs is prepared.

SQ I   How does Germany with the program Software Campus take into account the European innovation strategy represented by the EIT?

Within the multi-level governance in the EU, actions are taken on various levels whereby the European and the national level are put in the focus of this research. According to the literature, the German Government in this concept of multi-level governance functions as a translator of the European innovation strategy to the national level.

The basis for translating the EU innovation strategy to the national agenda is identifying similar problems to be solved. The case study shows that Germany and the EU determine comparable problems which can be summarized to missing entrepreneurial experiences of students. Furthermore, the strategy of the Software Campus and the EIT also show commonalities concerning the actions taken to address this problem for instance by applying the knowledge triangle. The only larger difference concerns the size of the targeted industry firms. Nevertheless, the case study emphasizes the role which Dolinar (2010, p. 99) attributes to national governments within the multi-level governance concept as the policy implementer. Consequently, the Federal Government is the driving force in the EU innovation system. In that regard, the Federal Government uses its governance power to set 'explicit goals for society and intervening in it in order to achieve these goals' (Jachtenfuchs & Kohler-Koch, 2004, p. 99) simultaneously on the national and supranational level.

However, the case study shows as well that there is no critical mass of international students reached which could provoke impacts on the European innovation policy. The Software Campus is rather limited to the national market. Hence, it is concluded that the European innovation policy is well integrated in the German agenda but that the outcomes may not lead to large effects on the EU level. Nevertheless, certain future impacts of the Software Campus on the EU innovation performance can be expected due to the intentions of the German Government and the EIT ICT Labs Germany to expand the activities of the Software Campus to the EU level. By more strongly targeting international students and by transferring the program of the Software Campus to

other Member States, an increase in the commercialization of knowledge on the EU level seems probable. Since the Software Campus well reflects the EIT strategy, the transfer of the program to other EU Member States would also mean further spreading the EU innovation strategy.

For the EU, this transfer of best practice and the translation of the EU strategy is not enough. It still advocates for the supra-national action-taking to increase the commercialization of knowledge. Therefore, the EIT is structured in the way that it operates independently from the national governments based on the subsidiarity principle. It might be assumed that this results in the cutting of the 'political, juridical, administrative, economic and cultural sovereignty of the nation-state in the field of R&E' (Trondal, 2002, p. 350).

To sum it up, the program of the EIT ICT Labs Germany, the Software Campus, translates the EIT strategy to a large extent by addressing the same problem of lacking highly skilled labour force and applying very similar approaches for action-taking. Therefore, the Federal innovation policy seems to work as 'catalyst, promoter and regulator' (Kuhlmann, 2001, p. 960). After outlining this translation of the EU strategy to the national level, the following chapter presents the way in which the German Government uses policy instruments to contribute to the commercialization of knowledge in the EIT.

SQ II   *What policy instruments is the Federal Government using to contribute to the commercialization of knowledge in the EIT?*

The EU calls for improving the commercialization of knowledge by actions taken on the European level. However, the national governments are granted the possibility to use policy instruments to contribute to the EIT. In that context, it was expected that the German Government influences the EIT directly through the variety of policy instruments available. As it has been assumed, the result might be ensuring the commitment of the EIT partners to the initiative.

The policy instrument which the Federal Government intensively used to ensure the support of the other Member States to the EIT is the information instrument. Including the Member States in discussions during the creation of the EIT might increase their prospective support for the EIT and for the goal of increasing the European commercialization of knowledge. When the Federal Government in the first half of 2007 hold the Presidency of the Council of the EU, it organized and steered for instance informal Min-

isterial meetings. These meetings were particularly used to discuss the concept of the EIT. In that way, the German Government also designs the ways in which the EIT supports the commercialization of knowledge in Europe.

In the phase of the operation of the EIT, the national governments in general can make use of legislative instruments to contribute to the EIT's operation. These concern for instance the regulation on the recognition of degrees awarded by the institute. In the Federal Republic of Germany, this recognition concerns the area of education policy and thus, lies within the scope of competencies of the federal states. Hence, the Federal Government has no competency in that regard.

Nevertheless, the case study reveals that the national governments particularly contribute to the performance of the EIT's sub dimensions KICs. The entities established in the Member States, they refer back to and benefit of the national networks of industry, research and HE. Germany also benefits from the KICs to use the policy instrument of best practice for instance for translating the program Software Campus to other EU Member States who host the EIT ICT Labs. Consequently, this policy instrument is of considerable importance to the German Government for increasing the commercialization of knowledge in Germany and the EU. This finding proves the expectations of Jofre and Dannemand Andersen (2009, p. 6) who state that competition of national ideas for innovation programs and mutual learning are the driving forces within the multi-level governance in the EU. Furthermore, the authors seem right when suggesting that translation of role model concepts such as the Software Campus might accelerate the adaptability of national innovation systems to the European system (Jofre & Dannemand Andersen, 2009, p. 6). In that regard, the German Government uses the policy instrument of information to improve commercialization of knowledge within the EIT.

Moreover, the German Government uses financial instruments – well representing what Hood (Hood, 1984, p. 78) defines as treasure – to influence the performance of the EIT and in particular, on the KIC level. For instance, the EIT ICT Labs Germany GmbH is financially supported in its operation and funds are provided for its programs. The support for the concrete EIT programs is well illustrated by the Software Campus. Here, the BMBF subsidizes the program with € 5 million for its operation and additionally, offers up to €100,000 for each research project conducted by the students participating in the Software Campus.

In conclusion, the range of policy instruments available to the German Government in the EIT and the KICs is restricted to information and financial tools. It is worth noting that the Federal Government influences the commercialization of knowledge in the EIT mainly indirectly through its executing bodies, the KICs. Using these two kinds of instruments, might not directly ensure the commitment of the EIT partners to this initiative. Nevertheless, the financial subsidies are considerably relevant for the engagement in the EIT and the KICs because they cannot finance the new, capital-intensive research and because of uncertainty of these investments (Kaghan & Barnett, 1997, p. 74). The way in which the information instrument is used and might promote the commitment of the network partners, is outlined in the upcoming section.

> *SQ III   How is the information policy instrument used for the commercialization of knowledge in the case of the EIT ICT Labs?*

According to the theoretical framework provided in chapter 2, the Triple Helix network relies on an intense use of the information instrument. In particular, communication between the actors is needed for the implementation phase and for ensuring the commitment of the Triple Helix network partners. Moreover, the literature suggests that bringing together industry, research, HE and the government with their different perspectives at diverse places for the information exchange accelerates the process of commercialization of knowledge.

The case study of the Software Campus illustrates that the actors of industry, research, HE as well as the government do not share common interests, neither concerning the reasons nor the objectives of their involvement in the program. Nevertheless, the diverse perspectives are joined in the newly established trilateral network of the Software Campus (Etzkowitz, 1997, p. 142). In contrast, Rohrbeck and Pirelli (2010, p. 13) outline the risk that these differing interests could result in conflicts among the partners. In turn, this would lead to a slowed down process of creating of the network. In a certain way, the case study contradicts this finding because the usage of the information instrument particularly contributed to the creation and implementation of the Software Campus. Here, the National IT Summit as an institution used for information purposes is of huge relevance.

The BMBF made use of the National IT Summit as an information instrument to fulfil its function as a creator of HE programs based on the concept of Triple Helix (Thune, 2010). Moreover, the Summit is used for information collection as well as information release whereby the BMBF performs the role of the data broker (Walker &

Taylor, 1999; Hood, 1984). In this role, the BMBF brings together industry, research as well as HE and mediates between the partners as the co-president of the working group which created the Software Campus. In contrast, the boundaries between the other functions – data provider and data user according to the definition of Walker and Taylor (1999, p. 4) – are blurred. This is particularly true for the trainings and the mentoring where the 'theoretically informed exchange of examples' (Leydesdorff & Etzkowitz, 1998) takes place. Here, industry and researchers simultaneously provide information and use the data other partners presents.

Furthermore, the case study shows that the information instruments are also used for providing feedback on how the students' research advances and how the program performs. According to Leydesdorff and Etzkowitz (1998), in particular positive feedback is legitimizing the allocation of resources by the actors other than the government to the network. In the Software Campus, this feedback is provided by the BMBF and the Chancellor on the National IT Summit. This implies that the support of the German Government is essential for maintaining the commitment of the business partners, the research institutes as well as universities.

Lastly, the meaning of the best practice instrument as determined by Lascoumes and Les Gales (Lascoumes & Les Gales, 2007, p. 14) needs to be stressed. First, best practices are used within the Software Campus network among industry partners on how students are integrated in the business. Secondly, the best practice instrument is used to translate the program from Germany to other EU Member States. In the future, this transfer of the Software Campus model to for instance Finland might probably result in reaching the critical mass of human resources across the EU Member States. Thus, using the information instrument further increases the commercialization of knowledge through the EIT and in the EU.

All in all – like the literature suggests – the information instrument is intensively used to bring together the three helices and to join their forces and to facilitate the implementation of Triple Helix networks. Moreover, it ensures the commitment of industry, research, HE and the Federal Government to the network despite their different perspectives.

(6) CONCLUSION

This chapter aims at giving a concluding answer to the main research question of this study. The presentation of the role of the German Government in the EIT ICT is then followed by commentaries on the study's contribution to the current state of research and on its implications for future research.

(6.1) THE ROLE OF THE GERMAN GOVERNMENT IN THE EIT ICT LABS

The theoretical framework provided in chapter 2 suggests that the German Government functions as a broker in the Triple Helix network in the multi-level governance in the EU mediating between the partners on different territorial and functional levels.

In that regard, the case study helps to determine the role of the German Government in these two perspectives. In a vertical perspective, the Federal Government is situated in the concept of multi-level governance. The horizontal perspective refers to the involvement of actors from the sector of industry, research and HE as well as the Federal Government. For the purpose of facilitating the understanding of the role of the German Government in the EIT ICT Labs from these two perspectives, Figure 4: The role of the German Government in the EIT ICT Labs illustrates what is described in the following.

The figure shows the Triple Helix structure of the network of industry, research and HE as well as the German Government whereby each sector is represented by one helix. Furthermore, the helices are twisted one with the other resulting in a spiral relationship which corresponds to the definition of the spiral model of innovation by Etzkowitz and Leydesdorff (1997, p. 1). Due to the research focus on the information instrument, the Figure 4: The role of the German Government in the EIT ICT Labs emphasizes the communication between the actors by illustrating the identified places for information exchange by conjunctions between the helices. The links between the Government and the industry as well as HE and research evolve from being relatively intense in the beginning to becoming more loosely later on. This reflects that in particular the use of the information instrument by the Federal Government was strongly relevant to tie together the actors of the Triple Helix network. Nonetheless, the 'multiple reciprocal linkages' remain present 'at [all] different stages of capitalization of knowledge' (Etzkowitz & Leydesdorff, 1997, p. 1). Thus, the case study findings reflect very well, what van Vught & Dill (2010) and Thune (2010) state about the role of the national

government in the EIT in general. In their view, national governments are primarily interested in the creation and maintenance of programs based on a Triple Helix network by ensuring that the conditions for communication are met. So, within the Triple Helix network, the Federal Government performs the role of the data broker and aims at mediating between the actors of functional – and also territorial – levels.

Now, the Triple Helix network needs to be situated on the horizontal and vertical axis. The horizontal dimension of Figure 4: The role of the German Government in the EIT ICT Labs indicates the degree to which a critical mass of the target group – here students who shall be provided with entrepreneurial skills – is achieved. Even though, their number is steadily increasing, the Government does not reach a critical mass on the EU level due to high organizational application hurdles for non-German students. An example is the provision of grants only to students enrolled at a national partner university. Consequently, the findings of the case study are in line with the argument of Colombo et al. (2008, p. 2), that national governments cannot reach this critical mass needed to improve the overall European innovation performance. Therefore, the authors emphasize the importance of a centralized infrastructure. Here, this infrastructure is provided on the EU level by the EIT ICT Labs. This leads to having a closer look on the location of the Triple Helix network on the vertical axis.

The vertical axis represents the multi-level governance in the EU where sub-national, national and supranational actors are involved. The case study shows that the analysed Triple Helix network is primarily influenced by national policy making through the information instrument. Moreover, the case study also demonstrates that the intention is to expand from the national to the European scope through this kind of instrument. So, the Software Campus provides a best practice example which can be translated to other Member States via the EIT ICT Labs. This makes the German Government being a driving force in the concept of European multi-level governance (Dolinar, 2010, p. 99). Here, it performs the role of the promoter of the European innovation policy because the support for the Software Campus means also the promotion of the EIT and EU innovation strategy. The transfer of the program to other Member States will also help to finally reach a critical mass of human resources across all the EU and so, to boost the commercialization of knowledge in the EU.

In conclusion, the German Government in its role as catalyst of EU innovation policy in the EIT ICT Labs sets important incentives for an accelerated implementation

of Triple Helix innovation networks. For this purpose, the Federal Government uses the policy instrument of information to ensure the commitment of the network partners engaged in the EIT ICT Labs to the programs aimed at promoting the commercialization of knowledge in the EU. So:

> *The German Government uses the information instrument to ideation-*
> *ally support the implementation of Triple Helix networks and to try to*
> *extent these to the European level through the EIT ICT Labs.*

(6.2) THE STUDY'S CONTRIBUTIONS AND IMPLICATIONS FOR FUTURE RESEARCH

This study analyses the role of the German Government in the EIT ICT Labs based on the case study on the Software Campus. This research shows that the Federal Government is embedded in a system of shared responsibilities between the EU and the Member States.

The results are based on the framework of the contextual and theoretical framework set in chapter I and II. Thus, it considers only the role of the German Government in the Triple Helix model and its position within the multi-level governance in the EU innovation policy. Specifically, it is focussed on the communication processes within the initiative of the EIT ICT Labs. Next to the limited consideration of other policy instruments, a main weakness of this research is that the dimensions analysed are not based on concrete measurements and that therefore the indicators depend on a common interpretation. Additionally, the case study analysed a unique example of the EIT ICT Labs. Thus, this study does not allow for a conclusion on a typical or general role of national governments in this EU initiative.

For further research, it might be interesting to have a closer look on how the federal structure of Germany influences its role in the EIT ICT Labs. It might be researched whether this federal structure facilitates or complicates the implementation of programs of the EIT ICT Labs.

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APPENDIX

FIGURES

Figure 1: EIT knowledge triangle
(European Insitute of Innovation and Technology, 2012, simplified illustration)
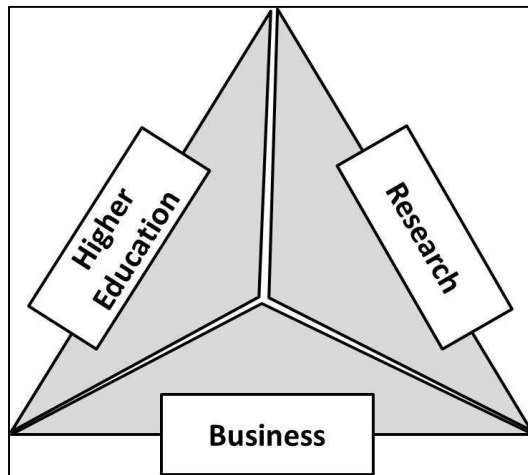
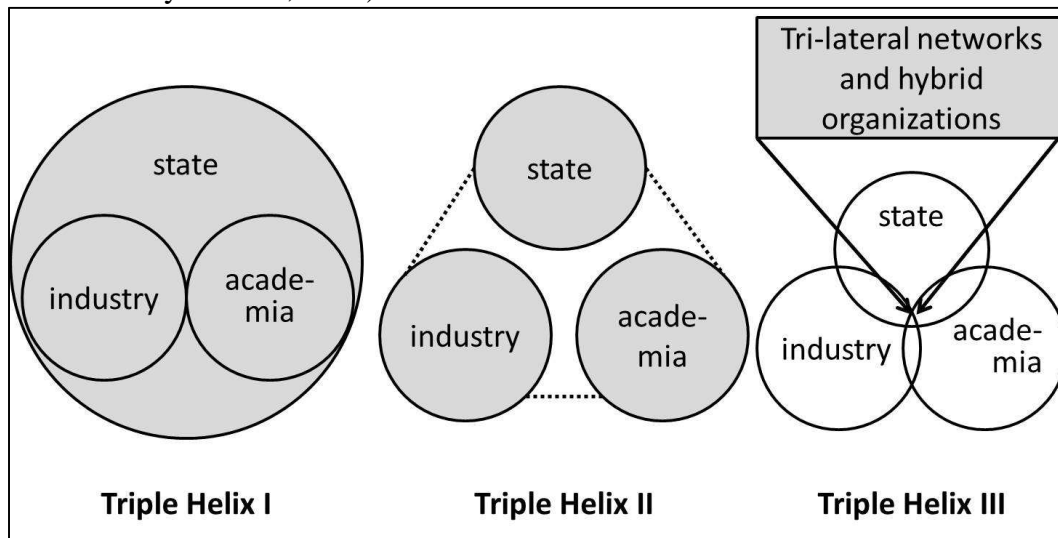**Figure 2: Triple Helix modes I-III**
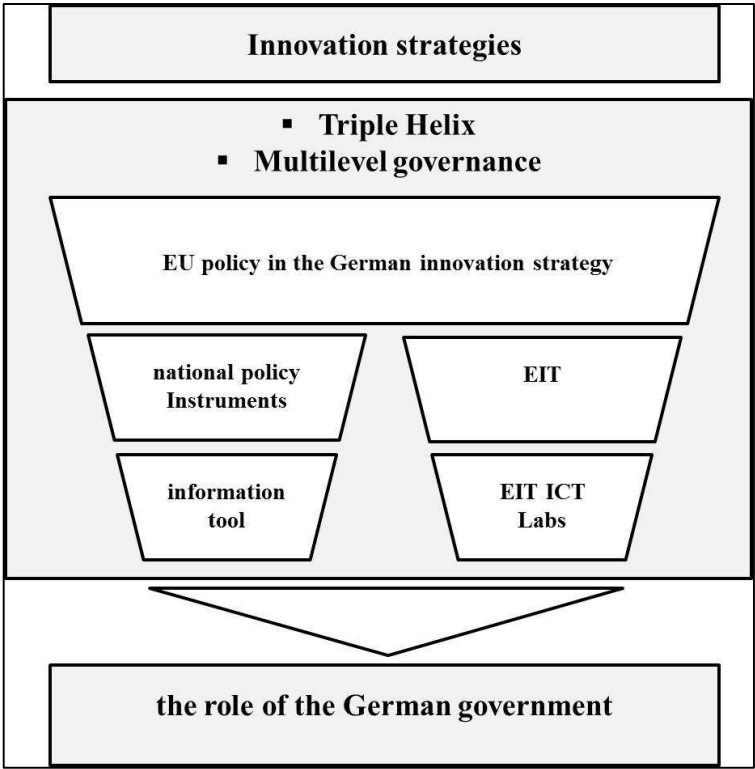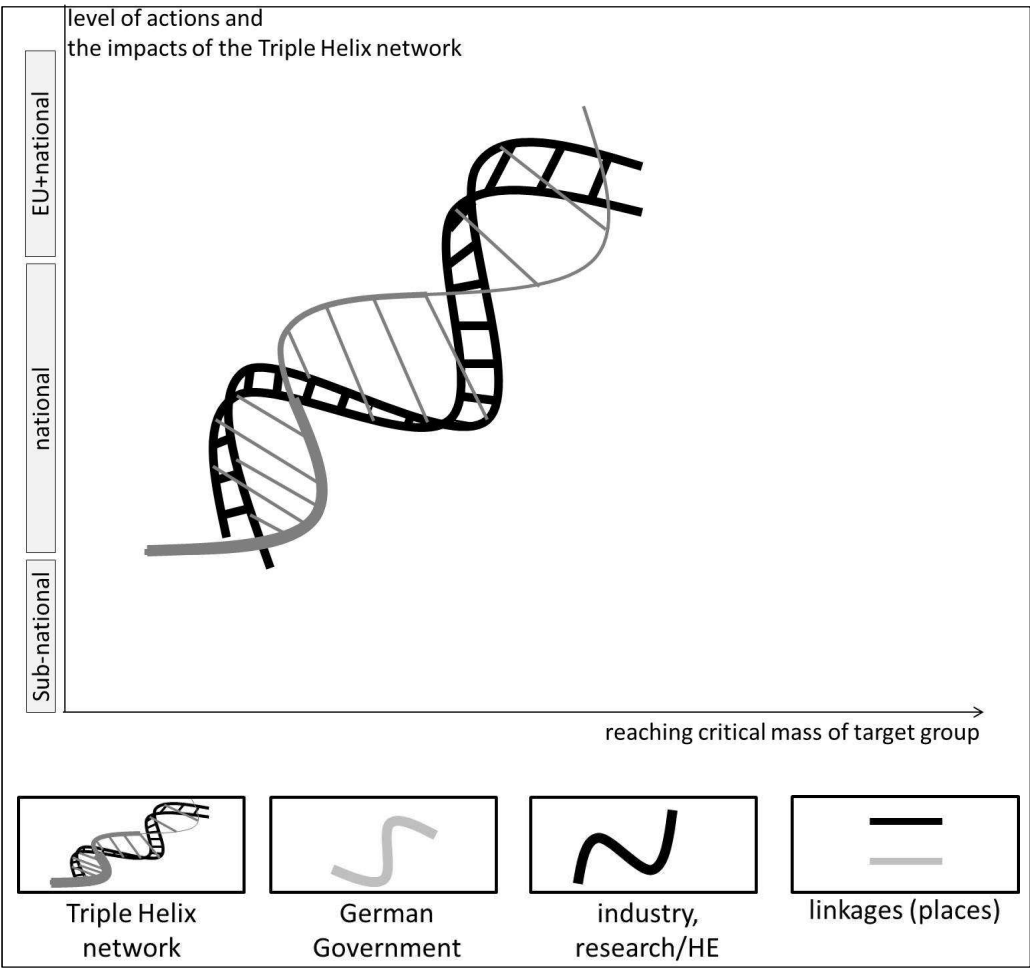(Etzkowitz & Leydesdorff, 2000)

Figure 3: Research process

Figure 3: Research process diagram showing Innovation strategies, Triple Helix, Multilevel governance, EU policy in the German innovation strategy, national policy Instruments, EIT, information tool, EIT ICT Labs, and the role of the German government.

Figure 4: The role of the German Government in the EIT ICT Labs

Figure 4: The role of the German Government in the EIT ICT Labs. Diagram with vertical axis showing levels (EU+national, national, Sub-national) and horizontal axis "reaching critical mass of target group", depicting "level of actions and the impacts of the Triple Helix network". Legend: Triple Helix network, German Government, industry, research/HE, linkages (places).

TABLES

Table 3: Policy instruments in higher education and innovation policy

	Legislation	Funding	Information	
Kuhlmann (Kuhlmann, 2001)	power	money	information	
LASCOUMES, LES GALES (Lascoumes & Les Gales, 2007)	legislative, regulatory	economic, fiscal	agreement-, incentive-, information-, communication-based	de-facto-standards, best practice
BÄHR (Bähr, 2010)**governance**	command, control	economic	suasive	
legal	hard, soft law			
BORRÁS (Borrás, 2013)	regulatory instruments	economic and financial instruments	soft instruments	
HOWLETT (Howlett, 2000)			substantive	procedural
HOOD (Hood, 1984)	authority	treasure	nodality	organisation

Table 4: Primary data sources according the dimensions

Dimension		Data source
Subsidiarity principle	I_a	Interview with the management of the Software Campus, 2013
	P_a-P_g	Press releases of the Software Campus, 2011-2013
	S_a	Speech of Chancellor Angela Merkel at the National IT Summit, 2010
	S_b	Speech of Chancellor Angela Merkel at the National IT Summit, 2011
	S_c	Speech of Chancellor Angela Merkel at the National IT Summit, 2012
	EIT Reg.	Regulation (EC) No 294/2008, 2008
	EIT SIA	EIT Strategic Innovation Agenda, 2011
	EIT_{2011}	EIT Annual Report, 2012
	IT Summit$_{2011}$	Arbeitsgruppe 1 - IT Gipfel, 2010
	IT Summit$_{2012}$	Promotorengruppe Kommunikation der

		Forschungsunion Wirtschaft-Wissenschaft, 2012
	$BMWi_{2010}$	Dresden Agreement, 2010
	$BMWi_{2011}$	Munich Agreement, 2011
	$BMWi_{2012}$	Essen Agreement, 2012
Mechanisms on EIT level	EIT Reg	Regulation (EC) No 294/2008, 2008
	EIT_{2013}	EIT Statement of revenue and expenditure, 2013
Mechanisms on KIC level	I_a	Interview with the management of the Software Campus, 2013
	P_a-P_g	Press releases of the Software Campus, 2011-2013
	EIT Reg.	Regulation (EC) No 294/2008, 2008
	EIT_{2012}	Catalysing innovation in the knowledge triangle, EIT, 2012
	IT Summit$_{2011}$	Promotorengruppe Kommunikation der Forschungsunion Wirtschaft-Wissenschaft, 2012
Types of places for communication	I_a	Interview with the management of the Software Campus, 2013
	I_b-I_d	Interview with a students of the Software Campus, 2013
	P_a-P_g	Press releases of the Software Campus, 2011-2013
	S_a	Speech of Chancellor Angela Merkel at the National IT Summit, 2010
	S_b	Speech of Chancellor Angela Merkel at the National IT Summit, 2011
	S_c	Speech of Chancellor Angela Merkel at the National IT Summit, 2012
	V_a-V_i	Youtube videos, 2013
	EIT Reg.	Regulation (EC) No 294/2008, 2008
	EIT SIA	EIT Strategic Innovation Agenda, 2011
	IT Summit$_{2010}$	Arbeitsgruppe 1 - IT Gipfel, 2010
	IT Summit$_{2011}$	Promotorengruppe Kommunikation der Forschungsunion Wirtschaft-Wissenschaft, 2012
	$BMWi_{2010}$	Dresden Agreement, 2010
	$BMWi_{2011}$	Munich Agreement, 2011
	$BMWi_{2012}$	Essen Agreement, 2012
Different perspectives	I_a	Interview with the management of the Software Campus, 2013
	I_b-I_d	Interview with students of the Software Campus, 2013
	P_a-P_g	Press releases of the Software Campus published from 2011 to 2013
	S_a	Speech of Chancellor Angela Merkel at the National IT Summit 2010

	S_b	Speech of Chancellor Angela Merkel at the National IT Summit, 2011
	S_c	Speech of Chancellor Angela Merkel at the National IT Summit, 2012
	V_a-V_i	Youtube videos, 2013
	IT Summit$_{2010}$	Arbeitsgruppe 1 - IT Gipfel, 2010
	IT Summit$_{2011}$	Promotorengruppe Kommunikation der Forschungsunion Wirtschaft-Wissenschaft, 2012

Table 5: Composition of working group 6 of the National IT Summit
(Bundesministerium für Wirtschaft und Technologie, 2013; Arbeitsgruppe 1 - IT Gipfel, 2010; Bundesministerium für Wirtschaft und Technologie, 2011)

	2010	**2011**	**2012**
Co-presidency	**BMBF** **SAP AG**	**BMBF** **SAP AG**	**BMBF** **SAP AG**
Members	▪ **Siemens AG** ▪ **Technical University of Darmstadt** ▪ BITKOM ▪ ZVEI ▪ **Deutsche Post AG** ▪ Gesellschaft für Informatik ▪ **Software AG** ▪ acatech ▪ **Deutsche Telekom AG** ▪ Seeburger ▪ Ministerial Conference of Education and the Arts ▪ **Deutsches Forschungsinstitut für Künstliche Intelligenz** ▪ Deutsche Forschungsgemeinschaft ▪ German Rectors Conference	▪ **Siemens AG** ▪ **Technical University of Darmstadt** ▪ BITKOM ▪ **Robert Bosch GmbH** ▪ **Deutsche Post AG** ▪ Fraunhofer-Institut für Rechnerarchitektur und Softwaretechnik (FIRST) ▪ acatech ▪ Deutsche Forschungsgemeinschaft (DFG) ▪ **Deutsche Telekom AG** ▪ Seeburger AG ▪ Formerly Continual Conference of Ministers of Education and the Arts of the Länder in the Federal Republic of Germany ▪ **Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (DFKI)** ▪ German Rectors Conference	▪ **Technical University of Darmstadt** ▪ BITKOM ▪ **Robert Bosch GmbH** ▪ **Deutsche Post AG** ▪ University of Potsdam ▪ acatech ▪ Deutsche Forschungsgemeinschaft ▪ **Deutsche Telekom AG** ▪ **Software AG** ▪ Seeburger AG ▪ **Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (DFKI)** ▪ Deutscher Akademischer Austauschdienst ▪ Microsoft Germany GmbH ▪ **Siemens AG**

(**emphasized** institutions are members of the Software Campus)

ATTACHMENT I – INTERVIEW GUIDELINE: THE SOFTWARE CAMPUS MANAGEMENT

Interview on the role of the German Government in the EIT ICT Labs
- Date and time of interview:
- Name of interviewee:
- Duration:

Part I   - Interviewer

- presentation of interviewer (student)
- explaining purpose of the interview (research project)
- anonymized interview, asking for permission to record

Part II   - Respondent

1. *Could you shortly describe your role in the Software Campus?*
   i. To what extent have you been engaged in the creation process of Software Campus?
   ii. What is your role in ensuring the working of Software Campus?
2. *How would you characterize the project Software Campus?*
   i. To what extent is its scope European?
3. *How did the number of partners involved in running the Software Campus evolve?*
   i. Is the overall number of institutions representing the industrial, higher education and research institute sector rising compared to the period of the implementation of Software Campus?
4. *Which are the policies influencing the working of Software Campus?*
   i. Is it mainly innovation policy of the German Government?
   ii. Or is it closer linked to Higher Education policy?
   iii. How is the European innovation policy influencing the strategic orientation of Software Campus?
5. *How did the overall strategic orientation of Software Campus evolve?*
   i. Where did these changes occur?
6. *What do you think is the German Ministry's primary ambition to be part of Software Campus?*
   i. What are its benefits?
   ii. Where do you think it sees its major task?
7. *What kinds of instruments does the German Ministry of Education and Research use to contribute to Software Campus?*
   i. Besides the provision of funds for the participating students, does it make available additional resources?
   ii. In which ways does the Ministry of Education and Research use the information tool as an instrument?
   iii. Is the Ministry of Education and Research the only network partner who provides opportunities for information exchange?
8. *How much importance do you attribute to information exchange?*

Part III   - Reflection

9. What do you consider the most important contribution of the German Ministry of Education and Research to Software Campus?

10. How much importance do you attribute to among the actors of Software Campus?

    i. Should it be focussed more or less? Why?

Part IV - closing, thank

Is there anything else you want to be mentioned regarding the role of the German Ministry of Education and Research in the Software Campus?

Thank you for this interview!

ATTACHMENT II –INTERVIEW GUIDELINE: THE SOFTWARE CAMPUS STUDENTS

Interview on the role of the German Government in the EIT ICT Labs

- Date and time of interview:
- Name of interviewee:
- Duration:

Part I   - Interviewer

- presentation of interviewer (student)
- explaining purpose of the interview (research project)
- anonymized interview, asking for permission to record

Part II   - Respondent

1.   Could you shortly describe your engagement in the Software Campus?
    i.   What have been the motives of your application?
    ii.   What do you expect from your participation in the Software Campus?
2.   How does your university support you for supporting your project?
3.   What are the main tasks of the industry partners in the Software Campus?
4.   Who are the network partners of Software Campus you are relatively closely connected to?
    i.   Who was your primary contact person within Software Campus during the application phase?
5.   What are the occasions for information exchange with industry and research institutions?
    i.   How are the events organized upfront?
    ii.   What are the issues raised at occasions for information exchange?
6.   How do you perceive the role of the Federal Ministry of Education and Research in Software Campus?

Part III   - Reflection

7.   Personally, how promising do you see the approach of Software Campus regarding its network of industry, research/university, and the Federal Government?
8.   How much importance do you attribute to communication among the actors of Software Campus?
        i.   Should it be focussed more or less? Why?

Part IV   - closing, thank

Is there anything else you want to be mentioned especially regarding the role of the German Ministry of Education and Research in the Software Campus?

Thank you for this interview!