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**THE EVOLUTION OF A HIGHER EDUCATION INSTITUTION'S
LOCAL ROLE IN A PERIPHERAL LOW-TECH REGION**

PhD DISSERTATION

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The one duty we owe to history is to rewrite it

Oscar Wilde, *The critic as artist*

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RESUMEN

La presente tesis se encuadra dentro del debate sobre el papel de las universidades en el desarrollo socioeconómico de las regiones. En la primera parte de la tesis se presenta una revisión de la literatura sobre economía regional, centrada en cómo tres conceptos principales –distrito industrial, cluster y sistema local de innovación-- han tratado desde sus respectivos enfoques teóricos, el papel de las instituciones de educación superior. En la segunda parte de la tesis se presentan los aspectos metodológicos de cómo abordar el análisis de un fenómeno tan complejo como es el de la evolución del papel de una universidad, atendiendo a la selección del caso estudio, los diferentes niveles de análisis, así como las técnicas de investigación y de recolección y posterior análisis de datos. En la tercera parte de la tesis se muestran los resultados empíricos traducidos en la presentación, tanto del contexto en donde se inserta la universidad objeto de estudio, como de las tres etapas identificadas en la historia de la institución que, si bien presentan características propias de una región de baja tecnología, han sufrido cambios institucionales que conviene tener en cuenta no sólo desde el punto de vista de las políticas universitarias, sino también desde el punto de vista de la gestión de las instituciones de educación superior. Definitivamente, en la cuarta y última parte de la tesis se presentan las principales conclusiones que se desprenden del estudio realizado a lo largo de esta tesis.

RESUM

La present tesi s'enquadra dins del debat sobre el paper de les universitats en el desenvolupament socioeconòmic de les regions. Consta de tres parts ben diferenciades. En la primera part de la tesi es presenta una revisió de la literatura sobre economia regional, centrada en com tres principals conceptes –districte industrial, *cluster i sistema local d'innovació-- han tractat des dels seus respectius enfocaments teòrics, el paper de les institucions d'educació superior. En la segona part de la tesi es presenten els aspectes metodològics de com abordar l'anàlisi d'un fenomen tan complex com és el de l'evolució del paper d'una universitat, atenent a la selecció del cas estudio, els diferents nivells d'anàlisi, així com les tècniques d'investigació i de recol·lecció i posterior anàlisi de dades. En la tercera part de la tesi es mostren els resultats empírics de la tesis traduïts en la presentació tant del context on s'insereix la universitat objecte d'estudi, com de les tres etapes identificades en la història de la institució, que si bé presenten característiques pròpies d'una regió de baixa tecnologia, han sofert canvis institucionals que convé tenir en compte no només des del punt de vista de les polítiques universitàries, sinó també des del punt de vista de la gestió de les institucions d'educació superior. Definitivament, en la quarta i última part de la tesi es presenten les principals conclusions que es desprenen de l'estudi realitzat al llarg d'aquesta tesi.

ABSTRACT

This thesis is framed within the debate on the role of universities in the socioeconomic development of regions. It has three distinct parts. The first part of the thesis presents a review of the literature on regional economy, focusing on how three main concepts - industrial district, cluster and local innovation system - have addressed from their respective theoretical approaches, the role of Higher Education Institutions. The second part of the thesis presents the methodological aspects of how to approach the analysis of a phenomenon as complex as is the changing role of a university, based on the selection of the case study, different levels of analysis and research techniques and collection and subsequent data analysis. The third part of the PhD dissertation presents the empirical results of the thesis translated into the presentation of the context in which to insert the university under study, and the three stages identified in the history of the institution, although their characteristics specific to a region of low-tech, have been institutional changes should take into account not only from the viewpoint of university policies, but also from the standpoint of managing Higher Education Institutions. Definitely, the fourth and final part of the thesis presents the main findings from the study along this thesis.

CHAPTER 1. INTRODUCTION

CHAPTER 1. INTRODUCTION

The current socioeconomic context of a global economic crisis presents a series of challenges to society, in general, and to businesses, Higher Education Institutions (HEIs), non-profit organizations and governments, in particular. A joint vision is more necessary than ever given the global nature of the situation we are living today (Landabaso & Anher, 2011). Parallel to this process of globalization, we can also see a growing interest in the local / regional dimension, so that sometimes there are tensions that must be analysed - not only consistently, but including the historical aspects that have led to such frictions (Storper, 1997; Rodríguez-Pose, 1999). The purpose of this thesis is to analyse the evolution of the historical role played by higher education in a region characterized by a dense network of firms associated with the category of "low tech": in short, a set of firms with a low rate of investment in so-called "research and development" activities.

Higher Education Institutions are usually formed by both teachers and researchers, as staff management and administrative support for the primary mission of the organisation. This mission can then be divided into three types of activities: teaching, research and knowledge transfer (Molas-Gallart *et al.*, 2002, Azagra-Caro, 2004). The balance between these three main activities depends on the relationship they maintain with their environment and the capability to have not only suitable staff but also agents with significant 'absorptive capacity' located nearby. Therefore, it is essential to consider not only the starting point of their activity, i.e. the origin of each institution of higher education, but also the changes that have shaped them over time. In this sense,

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we can expect a better understanding of the current role of HEIs if we consider a historical perspective over the medium and long term, which considers the main socio-cultural aspects that have influenced their evolution (Neave, 2001). Of these changes, we can highlight those related to the laws, habits and culture of the societies in which they operate. The nature of the research object is complex in nature and difficult to quantify, so the researcher has decided to opt for a qualitative study, aiming to further understanding of the configuration of the current role of an HEI through its interactions within its socioeconomic context.

The analytical framework adopted in this thesis comes from evolutionary economics and is focused around the concept of the local innovation system (de la Mothe & Paquet, 1998). The justification of this analytical framework is provided in Chapter 2, where the relevant literature is reviewed. This chapter explores three basic concepts: industrial districts, clusters and local innovation systems. These three concepts have been used in the literature as analytical frameworks for the study of actors, interrelationships and functions of heterogeneous institutions at the local/regional/national level, though emphasising the regional dimension (meso-level analysis). All of them provide different perspectives to understand innovation processes and their relationship with the socioeconomic context to which HEIs belong. As we will see, the local innovation systems approach is the only one that has explicitly addressed the role of HEIs.

The literature review chapter is devoted to develop two issues: First, to show how the literature on industrial districts, clusters and local innovation systems has addressed the role of Higher Education Institutions, and second, to identify the questions around which we will analyse the changing role of a specific HEI through a case study

Chapter 1: Introduction

methodology. Accordingly, the review will cover two main gaps. First, although the university is named in all three approaches (cluster, district, local innovation system), its role has not been well-defined. Second, there is a lack of examples of universities in low-tech contexts that have played relevant roles in the development of the local industries. In that sense and derived from the literature review, we consider relevant to study the nature and the evolution of, at least, one example of that kind of higher education institution, by bearing in mind their context and by pointing out, above all, the changing role played by university members in the accomplishment of their changing duties that have also evolved. This is why the two main research questions of this thesis are as follows:

1. How does the role of an HEI evolve in a low-tech context, including changes in its interactions with society at different levels (local, regional, national, international)?
2. How does the role of the university personnel evolve, according to its social context?

Chapter 3, meanwhile, will delve into the methodological aspects of the study. First, we develop the rationale for selecting the case study, based on the analysis of the changing role of the Alcoy Campus of the Polytechnic University of Valencia. Second, there is a fairly broad scope of analysis and a limit to the number of actors that could be covered in the thesis within a reasonable time for a doctoral study. The levels and units of analysis that were addressed in the study are described here. Third, data collection techniques are described, primarily the in-depth interviews, and the steps taken into

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account in developing the case study are outlined, including the collecting and analysing of data, and the writing up and dissemination of results (Neale *et al.*, 2006). Finally, the chapter describes the background of the researcher, recognizing their participation in, and influence on, the subject of study. This recognition is characteristic of reflexive qualitative studies that address phenomena where it is difficult to separate the investigator's judgment of the investigated object (Coller, 2005).

Chapter 4 presents the major results obtained through the case study of the higher education institution located in a peripheral region with a low-tech firm base. This empirical section illustrates and deepens (through example) those aspects previously addressed in the review of the literature. Besides this, the empirical section begins with an analysis of the context in which the university operates.

Finally, Chapter 5 presents a set of conclusions and implications. These conclusions will highlight that knowledge about the issues identified in the review of literature has been poorly developed to date. The latter part of the thesis summarizes the different contributions of Higher Education Institutions in low-tech intermediate regions. It also includes a section which recognizes the limitations of the study that should be addressed in future research on this subject.

CHAPTER 2. LITERATURE REVIEW AND
RESEARCH TASK

CHAPTER 2. LITERATURE REVIEW AND RESEARCH TASK

Over the years, the role of Higher Education Institutions (HEIs) in society has been intensely debated, the question reigniting most often when HEIs have been experiencing difficult times¹. The role that HEIs play within their societal environment will depend, among other factors, on the specific characteristics of the region in which they are located, that is, their *context*. Each region has historically faced different challenges; therefore HEIs have followed different developmental patterns. Yet, HEIs have all responded to the changes and challenges posed, among others, by globalisation trends and the development of information and communication technologies (ICT).

The importance of social and economic factors that explain the development of the local *context* has been analysed by various scholars. For instance, in the literature concerning the location of firms and the dynamics of agglomeration, two main concepts have been principally developed by economists and geographers: industrial district and cluster (Becattini, 1979; Porter, 1990; Porter, 1998; Porter, 1998a; Becattini *et al.*, 2009). While the industrial district concept traces its roots back to the late 19th century, the notion of cluster was born during the 1990s to understand not only the new competitive forces at play, but also to promote deliberate policy initiatives that foster linkages -- “cooperation”-- among firms and institutions which are simultaneously “competing” (Porter, 1998). Since the late 1990s, a third approach, the local innovation system, has

¹ Although “it is premature to predict the decline of universities” (Godin & Gringras, 2000:274), some pessimistic authors think that “the university in ruins” is fast approaching (Readings, 1996).

also contributed to this debate by highlighting knowledge dynamics and interactions between different actors (institutions) in order to gain a more precise insight into the innovation processes in a local setting. This thesis adopts the local innovation system approach; given its focus on analysing those institutions generating and disseminating new knowledge, this approach is the most appropriate to scrutinize the evolution of a local HEI within a specific setting.

In this vein, the present literature review contains a brief historical perspective of, first, the research problems addressed in analysing the changing role of HEIs from an institutional viewpoint (section 2.1); and second, how the role of HEIs has been considered in the different approaches mentioned above (section 2.2). Within the latter section, two contrasting perspectives are presented. One highlights the location of firms and the dynamics of agglomeration, while the other emphasizes the importance of knowledge dynamics not only among the local actors but also with external players.

The industrial district and cluster models will be analysed in depth in section 2.2. Later (in section 2.3), the local innovation system approach is explained as a means to understand the determinants of innovation in a particular territory (de la Mothe & Paquet, 1998). The overall aim of this second chapter is to provide a comprehensive conceptual framework to appropriately address the research gaps (posed in section 2.5) that will be examined accordingly in the subsequent chapters.

2.1. The Changing Role of Higher Education Institutions

Throughout their long history, Higher Education Institutions (HEIs) have been considered organisations key to society for their central role in fostering and propagating knowledge. Since the 1990s, it has been argued that HEIs have been

moving from “an ivory tower to an entrepreneurial paradigm” (Clark, 1998; Etzkowitz *et al.*, 2000). This transition still remains the focus of attention for many researchers, policy-makers and analysts in universities, governments and supranational organisations (Martin, 2003; OECD, 2007). These experts are concerned with the consequences and the challenges of this knowledge-driven era that continue to shape the role of today’s university (Castells, 1996). Since this section cannot deal with each of the vast array of views and issues that have emerged in the past decades, a set of only the most significant debates for the thesis will be introduced from a historical perspective. First, section 2.1.1 remarks on the origin of HEIs and their development paths from their origins. It also describes a set of key milestones in the historical development of HEIs, thus offering a better understanding of the context in which HEIs are currently framed. Second, section 2.1.2 describes the loss of the university’s monopoly in the new knowledge production process and the recent advent of new players in the higher education sector. Third, section 2.1.3 deals with the emergence of New Public Management approach in higher education debates. Finally, section 2.1.4 (Discussion) serves to interweave the aforementioned sections to then propose an adequate conceptual framework with which the research gaps can be addressed.

2.1.1 Origin and Principal Milestones in the History of the University

Although the university as an institution has experienced shifts and challenges during its nearly thousand-year history, over the last half-century, this institution has been undergoing its most profound changes (Florida, 1999; Geuna, 1999; Mora, 2001; Azagra-Caro, 2004; Bueno-Campos & Casani-Fernández de Navarrete, 2007). As a consequence of these transformations, the university has morphed into a profusion of

variegated forms –what Martin (2003: 14) has called “species” – to adapt itself within its own context.

While it is difficult to define the history of this established institution, Mora (2001: 96) distinguishes three main periods in the history of the university. The first period runs from its inception in the Middle Ages until the end of the 18th century. Mora sees the university during these centuries as an autonomous and self-financing² institution of students and masters (ibid: 97). Concomitant with the emergence of the nation states, the 18th century universities were nationalised and their function turned towards serving national interests, such as the diffusion and promotion of the national language and culture. In so doing, academics came to be recognized as an important part of the national elite. The so-called “modern” university system will be dominant in most European countries from the end of the 18th century until very recently, 1980s-1990s approximately, depending on the country.

It was during this second period that the so-called “Humboldtian” model emerged (ibid) (Perkin, 1984, pp. 34–5). This model has been seen as an attempt to integrate two main functions: teaching and research (ibid; Azagra-Caro, 2004; Beraza-Garmendia & Rodríguez-Castellanos, 2007). Although it originated within the German university system, many authors argue that this model gradually spread over the Western world and the unity of research and education was adopted across most European countries (Geuna, 1999; Mora, 2001; Azagra-Caro, 2004; Beraza-Garmendia & Rodríguez-

² Arias (1997) cites the example of the University of Salamanca which was able to loan money to the Castilian Crown (also cited in Mora, 2001: 97).

Castellanos, 2007). Since the 1960s,³ a third model of the university has emerged. This model has been labelled as the “universal university model” (Mora, 2001: 96). While the 20th century was generating some of the most radical social transformations in history, the university was moving from an elitist to a more egalitarian institution. The ethos of the pursuit of truth and knowledge that had previously constituted the core of the university’s mission since the Enlightenment was replaced by “the social project of equality, democratic plurality, justice and dissemination of knowledge” (Nokkala, 2007: 43). This new function was devised to face such challenges as increasing numbers of students, organisational changes and –more recently– financial crises, in addition to the difficulties posed by pursuing sustainable development. In parallel with these new developments, profound socioeconomic transformations were taking place across numerous spheres: transformations in the model of production, in the division of labour and in the progress of technology; in short, in the way society was understood. In his summary of the recent changes that have comprehensively shaped the university of today, Martin (2003: 10-11) groups these influences within three global shifts: first, the increasing competition derived from the openness of more market-economy countries; second, the significant constraints in public expenditure to meet increased demands for public services (health care systems, universal education and social welfare programmes); and third, the increasing importance of scientific and technological competencies in the forms of both knowledge and skills.

³ In some countries this milestone may differ. It might be observed in the 1970s, the 1980s or even the 1990s.

2.1.2 *The End of the University Monopoly on Supplying Knowledge*

In recent years, the number of universities has substantially increased. Likewise, “tertiary education enrolment [*has*] surpassed 50 percent in Japan, the United States and Western Europe” (Teichler, 2001: 3). With this dramatic increase in educational offerings, a shift has occurred in the role of the university as other organisations have emerged supplying services in direct competition. Although universities have traditionally been the institutions tasked with creating and supplying knowledge to society, amidst this increased demand the 20th century witnessed the appearance of new players offering to fulfil these functions. Examples of these alternative institutions included technology institutes, technology-based consultancy firms, government laboratories, industries and think tanks. However, despite the fact that these increasingly important actors tended to diversify the sites of knowledge production (Gibbons, 1994), universities have remained at the centre of the knowledge production system and, what is more, those *new* actors rely heavily on universities’ expertise (Godin & Gingras, 2000: 273).

Today’s evolving information society, along with the revolution in information and communication technologies, has favoured the introduction of these new players, further weakening the university’s traditional grip on multiple areas of knowledge generation and diffusion. For this reason, many argue that the university should now limit itself to fewer roles-- thereby preserving its traditional core tasks-- and step away from the new, more demanding enterprises, such as spin-off creation, life-long learning, and patent licensing (David, 1994; Florida, 1999). Notwithstanding, these novel activities already make up the everyday life of many HEIs. Their incorporation into the genetic makeup of these institutions has varied, but the importance of local context has

been consistent in each, for instance, with respect to *the traditional way of doing things*. The adaptation to this new technology-based context points to stronger ties between components of the system rather than a marginalisation of any one actor involved in the knowledge production system (Godin & Gringras, 2000: 277). In this sense, we are witnessing an emergence of different organisations that compete directly with the university in terms of supplying knowledge to society, but at the same time, most of these new agents depend on the expertise provided by the university as an institution. That is why a detailed analysis of how the system has evolved, as a whole, would add more insights to better understand this new landscape, rather than an isolated characterisation of each institution's role.

2.1.3 The Emergence of the New Public Management Approach in Higher Education

Throughout the last two decades of the 20th century, a new field of studies generally known as “higher education research” emerged to address the problems, tensions and dilemmas that the increasingly complex higher education system had been confronting. To this day, this new field of research still remains inextricably linked to the debates concerning higher education policy and practices (Kogan & Henkel, 2000; Teichler & Sadlak, 2000; Teichler, 2003: 171). The field has also served as an attempt “to anticipate future problems and themes of debates in order to develop concepts and generate knowledge well in advance” (ibid: 171), for instance, with respect to funding issues, management and governance styles or the decision-making processes at the university level. The university decision-making process in particular has been intensely

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debated and, additionally, each institution has created its own “university culture” for making decisions (Mora, 2001). From a broader perspective, this aspect of decision-making entails a higher level of complexity in the study of the changing university's role. Most of the conflicts in the HEI decision-making process can be attributed to the differing-- and even contradictory-- values and purposes of their members (Hölttä & Nuotio, 1995: 15; Birnbaum, 1988). Clark characterises the university as a complex, loosely-coupled, yet expert organisation (Clark, 1986). This author stresses two main dimensions: the institutional (structured, formal and locally-rooted) and the disciplinary/academic (unstructured, flexible, and international). On occasion, these two dimensions encounter tensions that are context-based and additionally different subsystems within the university are not always connected, due to their identity and autonomy (Glassman, 1973; Weick, 1976). That is why a more comprehensive understanding of the university, as an open system, is therefore required. The concept of “loose coupling” helps to explain this persistence of diversity within a given university (Birnbaum, 1988).

In short, it is understood that HEIs not only interact with their environment but also have to manage their internal issues. The environment, which can include markets, stakeholders and political and economic factors, is difficult to predict. The internal issues are likewise manifold: academic freedom, leadership, social values, and interaction, to name only a few. Yet the complex task of studying these internal issues and the environment has increased due to other societal shifts, for instance, globalisation and, in the case of the European Union, the pressure for comparability between countries and regions.

2.1.4 *Discussion*

In general terms, a global view often loses not only the specific nature of the *context* in which HEIs are located, but also the different domains of study that have gone into configuring the main HEI functions: *teaching* and *research*. A comprehensive approach thus requires concepts that take into account the *context*. This calls for detailed historical analysis (Perkin, 1984), of how the actors, their functions and the relationships among them (Nelson, 1993) have shaped different local settings. In consequence, the present thesis integrates these elements, bearing in mind the complex heterogeneity found at different levels as has been pointed out by Smith and Webster (1997: 104):

Different academics pursue different knowledges, different teams of researchers combining and recombining to investigate shifting topics, different sorts of students following different courses, with different modes of study and different concerns among themselves, different employment arrangements for different types of staff – difference everywhere in this post-modern, flexible, accommodating university.

The next section will present three concepts related to the study of *context* that capture the dynamics and relationships among key socio-economic actors. By understanding how the different conceptual models treat the HEI in each case will enable a more appropriate framework to be constructed to address the research gaps in the literature.

2.2. The Importance of Firm Location and the Dynamics of Agglomeration

Today, economists consider the “local economy” as a geographical and economic platform for the organization of production and, as a consequence, as an opportunity to create new activities, goods and services, new employment and sources of income (Uzunidis, 2008: 187).

In the literature concerning the location dynamics of firms, two main concepts have emerged in recent decades to explain the dynamics of agglomeration: industrial district and cluster. Both face the challenge of describing *change* by introducing different dimensions such as the demographic, the political, the economic, the social, the technological, etc. The aim of this section is to briefly present the origin (section 2.2.1) and development of these two approaches (sections 2.2.2 and 2.2.3.) as they have received the most attention (both at the policy and academic levels) for more than three decades.

2.2.1. Marshallian Thought and the Industrial District Conceptualization

At the end of the 19th century, Alfred Marshall published his treatise, “Principles of Economics”. His analysis of some specific territorial organisations of firms has had profound intellectual effects in subsequent studies conducted mainly by economists and geographers. Marshall’s contribution⁴ in this area sought to explain how a set of small

⁴ Although it is acknowledged that Marshall contributed in a larger set of ways, this thesis will only highlight his contribution in terms of the industrial district concept.

firms were able to compete with the *factory system*, that is, an enterprise which integrated all its process stages within the same building.

The *factory* grouped all the various stages of the production process in accordance with the principle of scaled economies. However, this model of production was only efficient within certain market conditions: with an excess of demand, or a limited supply of goods. Supply thus dictated market conditions in the form of standardised products or price levels. In turn, the technology involved required the output of large quantities of standardised products, because the specialized machinery dedicated to each function would only be profitable in large factories. Nevertheless, any modification in the demand conditions would constrain the process of adaptation to the new specifications, above all in those products manufactured via the continuous-flow process.

In parallel with this development of the *factory system*, Marshall realized there was an alternative way of organizing industry. This alternative arrangement relied upon a set of small firms specializing in one, or a limited number, of the stages in the overall industrial process. Many of the obstacles encountered by the integrated factory-- for example, timely adaptation to qualitative variations in demand-- were overcome by this constellation of firms (Becattini, 2002: 19). In consequence, when demand was fragile or mercurial, the industrial managers could decide whether to integrate a given stage of the production process vertically, or outsource it. Concomitantly, consumers had quest for more fashion, which led to more demand for differentiated products. Considering the high risk of producing large series of standardised products when faced with increasingly sophisticated consumers, this model of the industrial district offered new ways to overcome these daunting challenges.

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The organisation model of production described by Marshall was based on many small, geographically-concentrated firms. According to Becattini (2002), this represented the first attempt to define the concept of industrial district. Furthermore, his definition was revolutionary in that it was couched in terms which were not exclusively economic, but which likewise integrated social, historical and geographical aspects. In contrast, as we will see in the next section, the concept of cluster is narrowly focused on purely economic analysis. The objective pursued by Marshall was to demystify the paradigm of the big integrated company (later to be called the Fordist model) by introducing the notion of externalities. Thus, many firms capitalize on the advantages present in their own environment where the same, or similar, economic activity was developing. For instance, many of the techniques specific to a given industry were disseminated informally among the working neighbourhoods. This phenomenon was metaphorically dubbed the “industrial atmosphere”⁵ of a territory (Marshall, 1890: 318). The externalities were grouped into three different types, according to their diverse benefits. First, knowledge spillovers were linked to the process of accumulation, in time and space, of specific knowledge shared in a given industry. Second, the interrelationships among actors led to the establishment of complementary activities that provided a set of specialized inputs, machines or services. As market size increased, services, in particular, grew accordingly. And third, a common labour market offered a wide array of skilled people that reduced the cost of recruiting and training them.

At that time, and even nowadays, any of the abovementioned externalities were intangible and immeasurable, in contrast to other variables such as accounting data, i.e., return on assets, productivity, level of incomes, etc. The culture, the skills unique to a

⁵ This metaphor will be discussed below.

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production process, the tacit agreements between clients and suppliers, the inherited traditions of the family business and the diffusion of tacit knowledge; all of these elements were all included into this set of essential, yet incommensurable, variables highlighted by Marshall.

In essence, the metaphor of the “industrial atmosphere” (ibid: 318) was built upon the idiosyncratic knowledge existing in a specific location, and the formal-- but, above all, informal-- relationships. Marshall highlighted the cases of Lancashire and Sheffield, where many small companies with similar productive specialisations and complementary activities were providing products and services to one specific sector, the textile sector. The conditions for such an “industrial atmosphere” emerged thanks to coexistence and a shared language, when the relationships between society, firms and institutions were fluid. The following quote captures and summarizes this:

When an industry has thus chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighbourhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated; inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. And presently subsidiary trades grow up in the neighbourhood, supplying it with implements and materials, organizing its traffic, and in many ways conducing to the economy of its material (Marshall, 1961, Par. IV.X.7).

According to Schumpeter (1983), it is not surprising that Marshall’s ideas were primarily played down by his coevals. In Bellandi’s opinion they questioned his “empirical rigour” and were suspicious of his “eclectic” thought (Bellandi, 2006: 43).

Only some years later was Marshall's reasoning rescued from obscurity to become a foundational element of an important body of literature bringing together studies of geography, sociology and economy that used the concept of industrial district to debate regional development strategies from the 1970s. Becattini headed a group of scholars who started to rebuild this part of Marshall's thought, but now framed within a new intellectual context (McDonald & Belussi, 2002). This reconstruction will be described in the next section.

2.2.2. Becattini's School: the Industrial District Re-conceptualization

According to many authors, Becattini is considered responsible for the recovery of one part of Marshall's thought, namely that which is linked to the notion of the industrial district concept. This section briefly revisits the historical evolution of this concept in three parts, although an extensive literature review can be found in the recently published *Handbook of Industrial Districts*, edited by Becattini *et al.* (2009). First, the genesis of this updated approach will be presented. Second, the different theories and definitions of the concept will be offered. And third, the current debates and the characterisation around this concept will be addressed.

The origins of the industrial district as a socioeconomic concept lies within the answer to the question: Why did a set of small firms show *continuous vitality* compared to the big integrated enterprises which were dominant until then? The reader must not forget here that, at that time (1970s), a profound crisis linked to an enormous increase in the price of oil was radically transforming the conditions under which firms and economies

were operating. Becattini, thus, rescued Marshall's idea of the industrial district and adapted it to a totally new situation.

Bellandi (2002) emphasizes that the type of sectors studied under the industrial district approach were linked to the so-called *traditional industries*, such as textiles, clothing and footwear. Around all of them a mechanical sector had emerged and blossomed to support the creation and advancement of new products and processes. From the supply side, several conditions enhanced the formation of the industrial district model. For instance:

a cultural complexity, done with values, knowledge, institutions and behaviours; a productive structure formed by factories, workshops, home-based works and family-based selfproduction; a credit system ready to finance the small but most promising initiatives, and that helps people to use their increasing leisure time to produce goods which may be sold as a stable product in the market (Becattini, 2002: 19)⁶.

From the consumer's point of view, there was a status shift in some societal realms that generated new demands for differentiated and customised products and services. This fact required adaptation on the part of the large-scale factories. Since these actors were too slow to respond to these new demands, more attention was paid to the Small and Medium Enterprises (hereafter, SMEs) as they seemed to be more capable of producing short and customised series.

All these factors contributed to the establishment of the industrial district as an appropriate organisational model. Among a multitude of existing definitions in the

⁶ My translation

literature reviewed, the following definition encapsulates most of the aforementioned characteristics of this model:

A socio-territorial entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district, unlike in other environments, such as manufacturing towns, community and firms tend to merge (Becattini, 1992: 38).

This co-existence of social and economic life is essential to comprehending the industrial district model. Although a pure industrial district model has never existed—it remains an *ideal* (Pyke *et al.*, 1992)—this approach has served to posit an influential alternative model to explain the organisation of large-scale production. Just as there are no two identical countries, nor two identical firms, each district is different. For that reason, the *context* (in time and space) becomes a decisive factor, as has been mentioned above. It is also important to note that, due to the increasing division of labour, for instance, the economy generates increasing levels of production which can outstrip the local markets' demand. With local markets saturated, this model assists in focusing attention on exploring external markets (outside the district).

Up to this point, the industrial district model has been obliquely discussed in terms of internal-external markets and brief definitions. Thus, it seems apropos to offer here a ten-point summary of the ideas Becattini and his colleagues have offered over the past forty years to serve as subsequent guidelines for determining what can be considered an industrial district (*ideal-type*).

First, Becattini points out that the most distinctive feature of the local community rests on “its relatively homogeneous system of values and views, which is an expression of an ethic of work and activity, of the family, of the reciprocity and of change” (ibid: 39).

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Therefore, this district model stipulates the steps the people who live in a certain location (the community will generally be identified with its territory and its activity) must follow to face future challenges. In turn, the existence of this *values system* fosters shared attitudes, which are normally adaptable to change and the initiative of their members.

Second, a population of firms is intrinsic to the formation of an industrial district. Nonetheless, “each of the many firms which constitute the population tend to specialise in just one phase, or a few phases, of the production processes typical of the district” (ibid: 40). Then, “the firms become rooted in the territory and this result cannot be conceptualised independently of its historical development” (ibid: 40). Again, Becattini recalls that there is no magic formula to configure an industrial district, but in general terms, there exists a long tradition that determines its formation. Thus, with different traditions, different types of industrial districts will emerge as a result. This argument is shared by Markusen (1996) and also by Paniccia (2002). The first author posed a comprehensive taxonomy of industrial districts in order to highlight important differences among different types of firms’ agglomeration. The following table describes her four *ideal-types*:

Table 1: Markusen's typology of industrial districts

The Marshallian industrial district	A group of small and medium-size firms with a clear supply chain or market expansion focus – e.g. Textile industry in Prato
Hub and spoke industrial district	An industrial area where one or more large companies act as a hub -- e.g. Ford in the Valencian automotive industry.
State-anchored district	A zone where public institutions - such as a university or a hospital – provide a development platform. The Cambridge England area, for instance.
Satellite platform district	A set of branch facilities of externally based multi-plant firms, often enticed into the area by state-offered Foreign Direct Investment (FDI) incentives. The Multimedia Corridor in Malaysia is a good example.

Source: Markusen (1996: 298-299)

Third, Sforzi (2006) indicates that the industrial district model is focused on “the direct action of the (*hu*)man in the production and of the conditions that regulate its productivity”⁷ (ibid: 38), rather than the decisions leading to the selection of the industry’s location. These factors can be linked to the continuous search for a job or an activity that fulfils people’s expectations and ambitions in the industrial district model.

⁷ Italics and translation are mine.

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Moreover, worker migration from one activity to another is not perceived as negative; in fact, this constant reassignment is thought to afford a superior pool of skilled workers for each phase along throughout value chain.

Fourth, the existence of a localised labour market facilitates the process of searching, recruiting and selecting personnel that Becattini (1992) has characterized as more efficient and “revealing” than the intricate processes undertaken, for instance, by the big companies, “with sophisticated information structures, psychological tests, etc.” (ibid: 42).

Fifth, the introduction of technological change, through a mutually-accepted process involving all the stakeholders concerned (employers, employees and trade unions, among others), confers an added feature to the industrial district model. This feature contrasts with the top-down approach typical of big integrated firms, where the managerial bodies usually make the decisions.

Sixth, the price determination process, it can be extended to those prices offered in the district’s domestic market (including, for instance, the credit system and the government administration). The same district acts as a moderator due to its system of values, as previously mentioned. For example, *word-of-mouth* (within the community of people) will tend to balance any pricing disparities among similar products. For a better understanding of the informal processes of communication among a community of people, one needs to know in advance how the system of values, and its concomitant rules, function(s) in the district.

Seventh, this identification with the territory fosters the creation of a unique “brand image” in the district. The origin of a product and its main features will always be

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associated with this “brand image” by the customer, as witnessed in the Sassuolo district and its ceramic tile industry (Lazzeretti, 2006). However, the degree of exportability of this “brand image” is limited by the differing values, habits and customs of the people living in different geographical locations.

Eighth, the generation of scope economies is fundamental to fulfilling large levels of demand. Once the domestic market is saturated, however, exports may be needed to give an outlet to the remaining production. As long as the district requires a large volume of inputs (i.e. raw materials, semi-manufactured and manufactures products) a concentration of specialized buyers emerges. Likewise, Becattini (1992: 71) states that “the links with the markets which supply raw materials or instrumental goods may turn out to be expedient also for the sale of goods produced in the district”.

Ninth, cooperation and competition can simultaneously co-exist within the wide array of actors as long as specialisation in each phase along the entire value-chain is well defined. The set of firms constituting the industrial district are organised in the territory and are aware of the increasing supply of products resulting from the competition present in the evermore-globalised market. Given the competitive pressures, the district firms need to join efforts to differentiate their products vis-à-vis those of *foreign* firms. In short, to reach a (temporary) monopolistic position in the market is desirable for the district firms to work together with a common goal through different types of cooperation: joint research projects, trade missions, joint ventures, to name only a few. These competitive alliances strengthen the relationships within the territory and provide new forms of both products and processes. These practices may become routine. In fact, Becattini and his associates started to study the Italian industrial districts starting from this point.

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And tenth, from a financial standpoint, an industrial district requires a local credit system to enable adaptation to the different challenges encountered (technological, organisational, logistic, etc.). Yet, since the financial system funds only those activities that guarantee the recovery of the principal, several problems may arise when the traditional activity is declining, or has simply been deviated to activities with only short-term benefits. An example can be found in the Valencian industrial districts during the construction bubble of the early XXIst Century; here and investment were diverted away from the industries that formed the districts towards investments in real estate (Golf-Laville & Ortega-Colomer, 2012).

To sum up, studies under the industrial district umbrella aim to explain the peculiarity of social, economic and political relationships (not only formal but also informal) within a community of people and firms, but necessarily with a multidisciplinary approach. This approach has been mainly used from the 1970s until the end of the 20th century, in particular in Italy and Spain, to understand the historical evolution of local industries and societies, and the evolution of the so-called traditional industries and in particular their tendency to agglomerate in certain places in the form of constellations of small firms. Those agglomerations of firms were questioned as an alternative way to survive in contrast with the model proposed by the big and integrated company.

However, the complexity and contextuality of this type of analysis has limited its use to inform policy. This has not hampered the generation of a large body of academic literature.

2.2.3. Firm Strategy and the Notion of Cluster

In this section the cluster approach is presented. The term cluster was coined in a series of case studies in several industrialized countries. The aim of Porter (1999) –and his associates– was to extend their previous analyses at firm-level and to focus on a firm's local environment by including the geographical dimension. This group of researchers had as an original objective the identification, definition and scope of clusters across the globe. They were primarily inquiring about the nature of the firms' competitiveness. The starting point that later enables the emergence of the cluster concept was the development of an industry attractiveness framework for the *five* competitive forces Porter identified; namely: the threat of substitute products, the threat of entry of new competitors, the intensity of competitive rivalry, the bargaining power of customers, and the bargaining power of suppliers. In fact, by analysing these changing five forces, Porter argued that one could make strategic decisions more appropriately since they summarise the main influences of the environment within which firms operate.

Later, Porter studied each link comprising the value chain, providing a very popular tool in the area of Management. This tool (the value chain analysis) was intended to identify the sources of competitive advantage of companies, firstly in the activities that add value and secondly in the difference between the benefits and cost of conducting them. This approach focused on the sources of competitive advantage sources at the firm-level (Porter, 1985). In 1990, based on the five abovementioned forces, Porter proposed the *diamond model* in order to understand the geographical determinant of the competitiveness of firms (Porter, 1990). The cluster framework was later fleshed out throughout the 1990s (Porter, 1998). Porter argued that the presence of agglomerations of firms leads to competitive advantages that lie in the local environment of the firm,

outside its boundaries. This is similar to the notion of the Marshallian industrial atmosphere, where institutions and knowledge spillovers are important factors to explain the competitiveness of the region.

Porter argues that firms endeavour to develop globally and thus focus on attaining competitiveness by searching for sources of competitive advantages, mainly in places with “knowledge, relationships and motivation” (Porter, 1998b: 78). He states that these specific resources (knowledge, relationships and motivation) can hardly be embedded accessed by competitors. Only firms in a specific locality can access them and, what is more, their location can be considered an entry barrier for those firms that do not belong to the cluster. Enright (1999; 2001) has further provided a series of factors that expand the dimensions to observe within clusters and improve their differentiation, i.e. geographical scope, density, breadth, depth, activity base, geographical span of sales, strength of competitive position, stage of development, nature of technological activities, innovative capacity, and ownership structure.

The Harvard University’s Institute for Strategy and Competitiveness –headed up by Porter– has played a crucial role in spreading the pragmatic ideas of the cluster concept around both academic and political circles (Ketels, 2003). The main vehicle to achieve this objective has been a consultancy firm affiliated to the Institute: the Monitor Group. Such trans-national institutions as the World Bank, the Organisation for Economic Cooperation and Development and the European Commission (hereafter, EC), have rapidly incorporated the idea of the *cluster* as a powerful concept and, simultaneously,

have developed so-called *cluster initiatives* and *cluster policies* (EC, 2008)⁸. However, despite the popularization of the cluster concept, it has also encountered its critics who argue that is too chaotic, vague and problematic (Martin & Sunley, 2003; Gordon & McCann: 2000). In response to these attacks, Ketels (2003) presented an overview of the current ontological status of the cluster concept stating that:

The field [referring to the cluster idea] is now entering a new stage of data-driven theory development, theory testing, and the development of a consistent framework for policy application” (Ketels, 2003: 3).

After more than ten years since the first appearance of the cluster concept in academic and policy literature, the European Commission delivered a document entitled “The Concept of Clusters and Cluster Policies and Their Role for Competitiveness and Innovation: Main Statistical Results and Lessons Learned” (EC, 2008). The document positions the European Commission within the conceptual and policy debates concerning the cluster concept. It aims to dispel possible “myths around clusters”, by giving the readers “a fact-based policy approach towards cluster support” (EC, 2008: 38). Nevertheless, the Commission admits that the data is unclear, undefined and unreliable, though the report does remark that “the data provides clear evidence that clusters are significantly related to prosperity” (EC, 2008: 29).

In order to avoid any confusion with the terms associated with the cluster concept, the European Commission attempts to define the differences between the concept of the cluster and cluster initiatives and policies. The cluster concept refers to “a group of

⁸ This thesis offers a critical analysis of this document (EC, 2008) to try to shed light on several inconsistencies found within it.

firms, related economic actors, and institutions that are located near each other and have reached a sufficient scale to develop specialised expertise, service, resources, suppliers, skills” (EC, 2008: 9). Although the regional dimension is emphasised in the definition, through networking and cooperation between companies and institutions, clusters may transcend political borders (ibid: 9). It is important to mention here that Boschma (2005) critically assessed the notion of *proximity* beyond this geographical dimension by adding four additional types of proximity: cognitive, organizational, social and institutional. This new approach to the understanding of *proximity* amends the exclusive focus on geographical proximity found in the European Commission document. While geographical proximity is linked to physical distance (i.e. kilometres between two or more actors), the remaining dimensions pointed out by Boschma provide new insights related to non-physical (psychological or behavioural) factors that affect the learning processes even within clusters or local agglomerations of firms and institutions. Therefore, an in-depth analysis of the institutions within a cluster is necessary to understand subsequent cluster initiatives and policies (Rodríguez-Pose, 2010).

As the EC document was published by the Directorate-General for Enterprise and Industry in the European Commission, it is no surprise that its focus is based principally on firms. However, since HEIs by Porter’s definition can be part of a cluster, it is surprising that the document disregards them; their role is thus tacitly considered to be merely a factor that is present. Rodríguez-Pose (2010) takes issue with this stance; in support of the importance of the presence of HEIs (among other variables), he argues that only those clusters with certain regional socioeconomic conditions can enhance their innovative capacity and generate growth. This author stresses that traditional factors, such as a hearty educational endowment or the presence of a technically-trained

labour force, play a significant role in both the generation and the assimilation of innovation (ibid: 24).

The EC document points out two main approaches for identifying clusters. The first is based on case studies, which provide qualitative information through interviews with local actors. The second approach, more quantitative, “is based on measuring indirectly the revealed effects of co-locations of businesses that are assumed to be observable when a cluster is present” (EC, 2008: 15-16). The indicators most used are *concentrated employment rates* and *productivity*. Maps also contribute to an appreciation of the evolution of existing industries: basically, their emergence, growth or decline. This methodology was developed by the previously mentioned Institute for Strategy and Competitiveness at Harvard's Business School. Since 2006, the European Cluster Observatory has been following these two different methodologies to provide information about the existence of European clusters. In 2007, this group delivered results concerning “regional clusters in 38 sectors, located in 32 countries” (ibid: 16). However, it must be noted that their methodology is still *in process* and must therefore overcome certain shortcomings in their interpretation of the data. As “they [*the report's data*] do not reveal causalities”, but rather “economic realities” based on employment rates, the qualitative information provided by case studies would complement these merely statistical indicators. In essence, the assumption that “interactions are meaningful” may lead to a misinterpretation of cluster mapping, and in consequence, as we will see later, the promotion of cluster initiatives and policies might be considered inappropriate.

With regard to the cluster initiatives, unlike the concept of cluster, they can be conceptualised as “organised efforts to enhance the competitiveness within a region”

(EC, 2008: 43). In this sense, this type of initiative can serve as a means to identify needs, coordinate efforts and promote new forms of interaction between the members of a cluster organisation. To this effect, private-public partnerships play an important role in the attempt to integrate the objectives of heterogeneous sets of companies and institutions competing with other companies and organisations located elsewhere. Furthermore, the fact that a vast majority of cluster initiatives are regionally-based may generate a conflict with the efforts of existing trade associations. Another issue to highlight is that cluster initiatives can be led by any type of organisation that belongs to the cluster. It is worth mentioning that assorted partners can group themselves to form a cluster. Thus, the description of a cluster formation appears akin to a *club* and is remarkably similar to current trade and managers associations, though nuanced by a set of modern terms and approaches.

There is a wide array of activities that a cluster of this type can perform, depending, of course, on the specific needs of their members. One important task “is the gathering of market and technical intelligence” (EC, 2008: 45) and “its further dissemination by publishing reports and newsletters” (ibid: 45). The cluster organisation serves as a bridging institution to cope with their members’ needs (training programmes, consultancy, and joint-sales advice, among others).

In contrast with the cluster initiatives, “[c]luster policy can be understood as a wider set of specific government policy interventions aiming at strengthening existing clusters or facilitating the emergence of new ones” (ibid: 31). Different types of policies and instruments can first be designed and then undertaken, contingent on the legal framework of each country or region, but above all, on the actual needs previously identified by the cluster members. The EC document takes Silicon Valley as a

benchmark, with economic growth as a desired policy objective for the European Union partners (ibid: 31). However, there is no clear explanation of how to achieve such an objective. Additionally, the EC document includes rhetorically the triple helix approach which, in the authors' words, "favours innovation and helps enterprises to better face global competition" (ibid: 31). Again, no explanation is offered about the relationship of the Triple Helix approach and how the cluster policies should be designed, implemented, or evaluated. In contrast, the EC document only provides some broad guidelines about how cluster policies might be understood based on successful examples. This lack of definition is a common feature of *cluster thinking* because it can be applied to almost any context.

Overall, the introduction of the cluster concept in the policy-making arena has been followed by a series of statistics that allow politicians and experts to label the cluster approach as an "evidence-based approach" (ibid: 5). Nevertheless, this is far from established since the EC is making assumptions on the effect and importance of clusters without showing the data on which such statements are based. Some examples found in the EC document are presented below.

Table 2: European Commission statements assumed as evidences (but not assessed critically)

Example 1: “Cluster firms are more innovative than non-cluster firms” (EC, 2008: 22)
Example 2: “Only 38% of all European employees work in enterprises that are part of a cluster” (ibid: 22)
Example 3: “Regions with a higher share of employment in industries that belong to strong clusters are generally more <i>prosperous</i> ” (ibid: 28)

These examples are treated in the document as truths to be accepted, rather than hypotheses to be assessed critically, which shows a lack of accuracy. The same lack of preciseness can be pointed out with regard to the definition of the university role within the cluster framework.

In sum, the concept of cluster has provided several insights into the study of the key drivers of competitiveness, taking a unit of analysis that combines *related sectors* and the *geographical dimension*. Despite the many criticisms raised about the problems in its theoretical and practical uses (Cooke, 1999; Markusen, 1999; Martin & Sunley, 2003), the European Union seems to have officially subscribed to this approach. In the next section, we turn to a perspective whose focus centres on the *innovation processes* (and hence, on knowledge dynamics among heterogeneous actors), rather than the agglomeration economies.

2.3. The Importance of Knowledge Dynamics

Over the course of the 1980s, the innovation systems approach blossomed as an alternative complementary approach to those previously presented (industrial district and cluster). The root concept from which different versions started to branch off was the *national innovation system*. This framework suggested the study of heterogeneous institutions and organisations and their interactions as a way to explain innovation: hence, in principle, it was an approach more than a prescription (Edquist, 1997). This approach will be addressed in a separate section for three reasons. First, the scope of the framework overcomes some of the limitations found in agglomeration-based approaches, such as the industrial district and cluster. Second, the framework explicitly adopts a systemic perspective to analyse the role played by all parts of society in the innovation process. And third, and perhaps most importantly, it focuses on the ability to create, search, exploit and distribute knowledge between different societal sectors to explain the differences in economic performance between countries, regions, sectors and firms. In this sense, science and technology organisations are called upon to re-think their role so that they might contribute more *directly* to economic development. As creators of *new* knowledge, universities are necessarily involved as well. Since the aim of the present thesis is to study the evolution in the role of an HEI, this framework appears particularly constructive in understanding the variety of contributions made by this type of organisation to economic development. In this regard, *knowledge* expands beyond the confines of an exclusively academic object of study, to become a vehicle for enhancing the innovative performance of organisations.

Nevertheless, the national innovation system concept has not been free of shortcomings, as pointed out by various authors (Miettinen, 2002; Sabel & Saxenian, 2008; Godin,

2009). Miettinen (2002), for example, has analysed its use and transformation within Finnish science and technology policy. Miettinen separated the innovation system literature from the science and technology studies already in existence that also focused on innovation processes. He then perceived and explored an important connection between these two streams of literature, previously overlooked⁹: the link between social studies of science and innovation studies in their respective efforts to analyse innovation processes. Miettinen (2002) suggested that innovation system thought – based on evolutionary economics – could be complemented with the approaches of studying innovations in Science and Technology Studies (STS). One example of these approaches is Actor-Network Theory which Miettinen (1999) had already highlighted as an approach to improve the understanding on concrete interactions and learning between the stakeholders in innovation networks. Another missing link the author explored in his 2002 book was the Lundvall's concept of learning, given the fact that in educational sciences and developmental psychology a deeper level of understanding is required when we talk about knowledge or learning. This author also qualified the innovation system concept as *transdiscursive* for its use in different arenas: policy, academia and business. In a critical publication, Miettinen (2002) concluded that such an ambitious target (the study of innovation from a systems perspective) could not have been achieved without the joint effort of an influential supranational organisation: the Organisation for Economic Co-operation and Development (OECD). Moreover, Miettinen's clarification helps to understand how the OECD helped to elevate the concept to a normative level. Likewise, according to Godin (2009), the OECD served as

⁹ Personal communication during the Workshop on “Rhetorical Analysis of Innovation Policies in the Contemporary Society”, held at University of Helsinki in 2010.

a platform from which to disseminate systems thinking in all their reports and recommendations from the 1960s on-- reports in which some key authors, such as Lundvall and Freeman, played an essential role since they were part of the board of consultants. In a recent book, Miettinen (2013) continued his previous line of argument stating that more resources from organizational studies are required to understand institutional change, given that one the NIS antecedents is rooted in institutional economics. And following this discourse, a connection between NIS discourse and the discourses of welfare (state) and democracy is crucial, and it had not explored deeply yet. In what follows, a review of the innovation systems literature is presented along with the salient characteristics and contributions of this approach.

2.3.1. Innovation Systems Approach: Fashionable or Eclectic Model?

Innovation studies have grown within the scientific community within a period of more than twenty years (Castellaci *et al.*, 2005; Fagerberg, 2009). The innovation systems perspective deals with “the creation of new resources in a situation marked by continuous changes in technologies, preferences and institutions” (Mytelka, 2000: 16). The existence of information asymmetries causes technological changes (Dosi *et al.*, 1988), which subsequently creates new opportunities to exploit this knowledge. Therefore, if we consider that uncertainties and disequilibria are “more the rule than the exception” (Barge-Gil & Modrego-Rico, 2007: 246), an adequate (and alternative) toolbox is required to take into account the complexity of the innovation processes. From an institutional viewpoint the focus is on how a set of organisations coordinates different processes and ideas to create new products and services (Galanakis, 2006).

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This set of given organizations is path-dependent and context-dependent (Pinto, 2009); thus, to understand this increasing complexity, we need a conceptual approach capable of describing the functions of and interrelationships between such heterogeneous organisations.

The emergence of the national innovation systems (NIS) approach traces its roots to the first OECD debates about the “systems approach” (Godin, 2009) during the 1960s, later developed as a theoretical approach in the 1980s by Freeman (1982)¹⁰ in Europe, and by Nelson (1993) in America. The NIS approach attempts to integrate many of the factors which had previously been excluded from innovation analysis. The interrelationships between different actors and institutions in the innovation process were a key element of this approach. Some of the main contributors to the NIS approach defined it as follows:

[NIS]... a network of institutions in the public and private sector whose interactions initiate, import, modify and diffuse new technologies (Freeman, 1987: 1)

[NIS]...is constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge (Lundvall, 1992:2)

[NIS]...is a set of institutions whose interactions determine the innovative performance of national firms (Nelson, 1993: 4).

Despite employing the same name (NIS), different nuances have arisen when authors have defined it. For instance, while Freeman and Nelson’s approaches are more *technology-oriented*, while Lundvall stresses that the key to innovation is the process of learning through the adaptation of existing knowledge to local and specific needs.

¹⁰ This article was newly published again in 2004 in the same journal, see bibliography.

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Further, Nelson and his colleagues focused their analysis on the role of private firms, universities and government within the system; in other words, they highlighted technological capabilities by including only influential organisations and institutions.

In a broad sense, two models of innovation systems have been proposed in the literature: the *Science-Technology-Innovation* model (STI), which emphasises research and development activities as a source of innovation; and the *Doing-Using-Interacting* model (DUI), which is inspired by an ampler view of innovation, based mainly on client-provider relationships (Jensen *et al.*, 2007). This distinction is useful to understand the variety of different sources to innovate. The first model can be mainly applied in territories characterized by a high presence of science-based industries. On the other hand, the second model can help to explain the innovation processes in low and medium-tech territories where R&D investments are not the main source to innovate. The implication of this distinction for the role of universities is that while R&D investments make sense in high-tech regions, other sources to innovate have to be promoted in those places where there is a low presence of high-tech sectors, for instance, the training of human resources, the provision of tailor-made services to firms, consultancy services, etc.

The local/regional innovation systems approach is a geographical adaptation of the NIS perspective (Cooke, 1992; Cooke *et al.*, 1997; Braczyk *et al.*, 1998; Autio, 1998; de la Mothe & Paquet, 1998; Doloreaux & Parto, 2005). This adaptation came about as a way to capture the peculiarities of different locations, even when they belong to the same

country¹¹. This geographical focus can contribute to an in-depth analysis of the context, but two main problems can be pointed out: the lack of data when analysing this local scale and the complexity of defining its boundaries.

Moreover, analysts employing a sectoral approach have emphasised the specific characteristics of innovation in different sectors, regardless of their territorial location (Breschi & Malerba, 1997), as seen in the definition below:

A sectoral system of innovation and production is a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products (Malerba, 2002).

One can affirm that the common feature (or purpose) of these related approaches is the analysis of the interrelationships among heterogeneous institutions, such as local/global firms, educational institutions, technology institutes, governmental regulatory bodies and others. As this specification of geographical (and sectoral) scale remains a part of the decision-making process, the researcher's approach must be justified by the inclusion of the same elements comprising the conceptualisation of NISs, though at a smaller scale (public sector, firms and social institutions). An additional problem that the researcher can encounter is the existence of informal linkages within the study of interactions among heterogeneous actors. Those informal linkages are difficult to identify and include into the analysis and as a consequence, their detection and further

¹¹ In the case of Spain, there are 17 autonomous regions, each with heterogeneous features encompassing not only the economic (GDP, productivity, structure), but also the socio-cultural (history, language).

analysis tend to be more complex than the formal relationships that can be compiled in datasets.

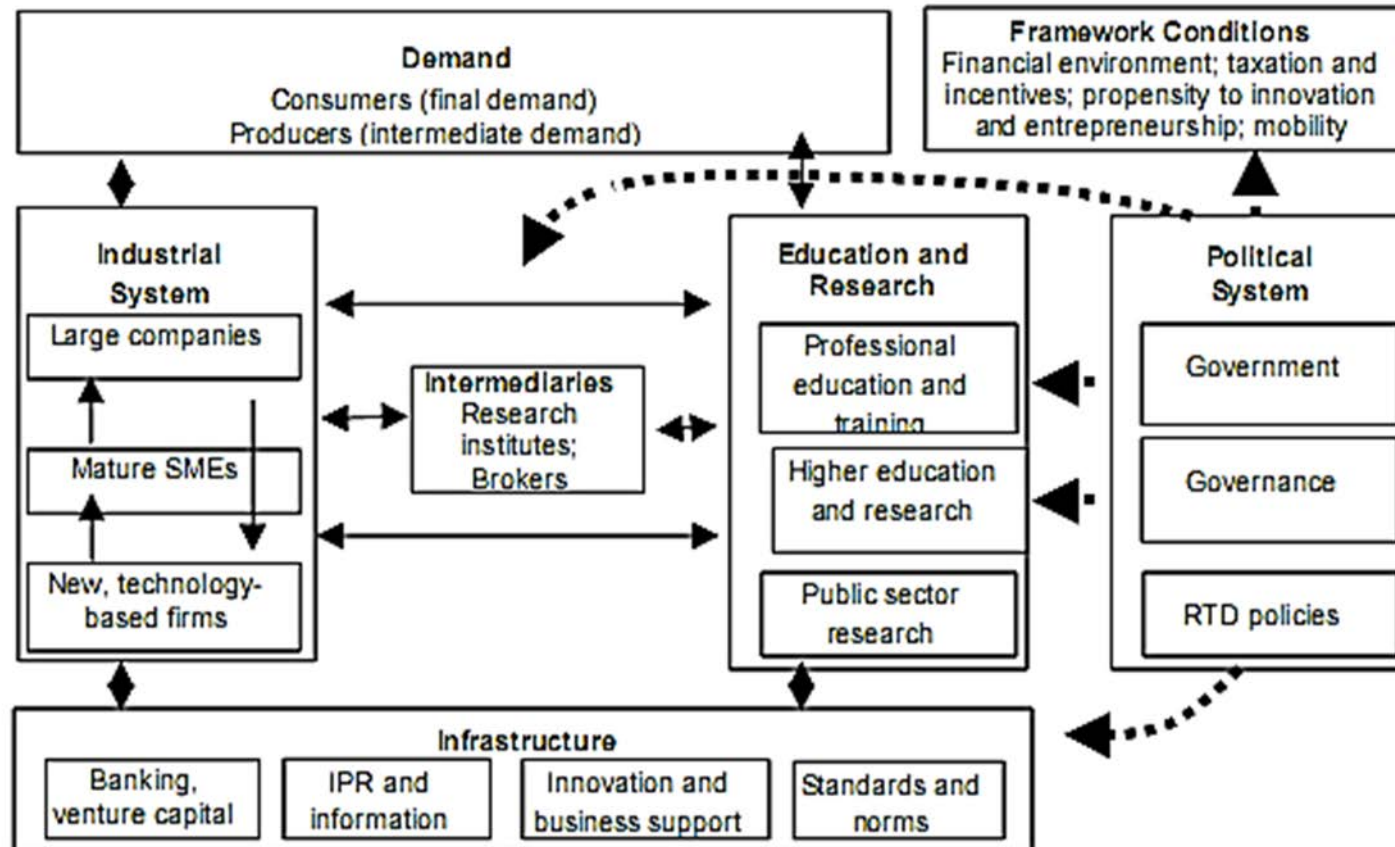
The innovation system model proposed by Arnold and Kuhlman (2001) has been used by several institutions (including the European Union) to trace out the potential linkages between institutions, and thus merits some examination. First, the nucleus of the innovation system is the *industrial system*: a set of firms located in the same territory and involved in related industrial activities. The industrial system includes not only core industries, but also supporting industries. Within this set of firms, some of them can be “new technology-based firms” adopting new technologies from other fields: ICTs or chemical companies, for example (Storey & Tether, 1998). Second, the *demand system* is also included in this analysis due to its importance in spurring on innovation in many sectors, namely consumer goods. For instance, most of the innovations spawned in the traditional industries, such as textiles, are prescribed by the market's specifications (ACC, 2007: 150; Hirsch-Kreisen, 2008; Robertson, 2009). Additionally, a distribution-channel analysis is necessary to gain a better understanding of the specific innovation system dynamics. Third, the *educational and research system* is constituted by all the private and public institutions whose objective is the transfer of technology and knowledge to the industrial system. Included in this category are the so-called “Research Results Transfer Offices”, Technology Institutes, HEIs and other agents, such as Intellectual Property management offices. Universities can widely provide not only *knowledge* and *technology*, but also *skilled personnel* that contribute to the local firms in the form of employees and consultants (Bonaccorsi & Piccaluga, 1994). Fourth, social agents are mainly made up by business associations, workers unions and consumer associations. Finally, framework conditions and political system regulate all

Chapter 2: Literature Review and Research Task

the above-mentioned agents and their interrelationships; in other words, the conditions for the functioning and dynamics of the system.

Overall, the importance of adopting this systems approach lays in the study not only of the organisations of the system as such, but also of the interactions among them. Although this has been studied deeply in high-tech contexts there still are a wide group of settings that have historically been underrepresented and that have ultimately been underlined by innovation's scholars (Hirsch-Kreisen, 2008).

Figure 1: Analysis Model of an Innovation System



Source: Arnold & Kuhlman (2001)

2.4. The Role of Universities in the Models

The review of the dominant concepts that deal with the regional dimension, and the interaction among actors to enhance the innovative capacity, shows a great deal of differences. Perhaps the main point is that a *systemic* view is only explicitly considered in the innovation systems approach. In this section, we present the main contributions in the literature that explicitly deal with the role of HEIs within the agglomeration-based models (industrial district and cluster) and also within the knowledge dynamics-based model (the innovation systems approach).

2.4.1. The Role of HEIs in the Agglomeration-based Models

The industrial district concept emphasises the historical and cultural aspects as means to understand the way industry has been organised jointly with the social community. This stream of literature has mainly focused on how the division of labour among a network of firms can challenge the rigidity observed in the factory system, or in other words, the vertically integrated firm. That is why, though quite prolific, the literature on industrial districts offers few studies concerning the role of HEIs in the socio-economic development of the district.

Historically, the roles of apprenticeship and the early vocational schools of the late 19th century have been studied due to their contributions to enhancing the skills of qualified workers within the district. In that sense, the primary, and perhaps the only, contribution of HEIs has been in their training and development of the local talent pool. For instance, Merlo (2009: 32) has analysed:

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a) how they [technical schools] really acted as the repository of a community's business, technological, legal and material culture that seems to be a distinctive feature of the IDs still today; and b) if they were actively involved in building up cohesive and durable (or weak and transitory) epistemic communities (Håkanson, 2005).

Within the few works found, we highlight the effort made by a group of Spanish researchers (mostly historians) who have studied the role of vocational schools in different Spanish locations, namely in Bergara, Barcelona, Valencia and Alcoy. The decision to study these specific settings seems logical: these sites were where the 19th century industrial revolution primarily took hold. Nevertheless, all of these studies refer only to the genesis of these locations and their original and primary contribution to the industrialisation process (Blanes-Nadal *et al.*, 2000; Caballer *et al.*, 2001; Cano-Pavón, 2001).

Another feature to highlight within the industrial district model is its strong geographical dimension. This regional component contrasts with the unclear geographical precision found within the cluster approach:

A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of a cluster can be a single city or state or a country or even a network of neighbouring countries (Porter, 1998: 199).

In this regard, we should not forget that the notion of proximity can be understood from different dimensions beyond the merely geographical (Boschma, 2005). Hence, the agglomeration models have to be complemented with other approaches that include a broader notion of proximity (social, cognitive, organisational and institutional).

Regarding the role of HEIs from the cluster perspective, there is again a lack of studies, though some efforts have also been made (Charles, 2003; Stoerring, 2005; Velluzi, 2010). It is remarkable to observe a paradox here: if the university is included in the cluster definition, why is there no in-depth analysis of their possible explicit benefits or roles? One tentative answer to this question could be that the focus of the analysis of cluster studies has not been *the university* as such, but rather *the firms* and their quest for appropriate strategies to compete in a globalised economy. In that sense, HEIs can be considered within the cluster policies, but depend on each particular case. For instance, in a recent book about *cluster policies* in Europe (Borrás & Tsagdis, 2009), there is not a single chapter or section devoted to the role of HEIs within the cluster framework. Again, the answer could lie in that the aim of the book is not related to the university role, but rather to the cluster policies undertaken in Europe and to the comparison of their experiences at a European scale, above all, from the firm perspective. Nevertheless, it can be argued that an explicitly underrepresented role of the HEIs in this stream of literature does not imply that their importance has been insignificant.

In summary, a possible explanation of why few industrial district and cluster studies have addressed in detail the role of universities within studies of industrial districts and clusters is that these two approaches have only partially referred to the importance of *knowledge generation* and *dissemination*. In that sense, the fact of being basically firm-driven models has to do with the exclusion of other relevant actors, such as the universities or other intermediaries that are also embedded in the territory. This gap is covered with the knowledge dynamics-based model of local innovation system as the next section will offer. The Role of HEIs in the Knowledge Dynamics-based Models

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A better understanding of innovation as a collective process of learning requires increased attention to the knowledge dynamics between actors. However, this aspect has traditionally been neglected within the agglomeration-based models, and hence, the question of *how (and to what extent) does an HEI contribute to its environment* has remained underrepresented until very recently. Since the 1990s, such an inquiry has been addressed using the innovation systems approach in its different forms: local, regional, national and sectoral (Lester & Sotarauta, 2007). However, the literature on higher education and regional development predominantly has focused on shining examples of renowned universities (Oxford, Cambridge, Stanford, etc.) that have successfully embraced not only a local approach but also, and more importantly, an international one. This is not trivial for at least three reasons: first, most universities are not located in contexts with abundant high-tech companies; second, most universities do not enjoy a huge endowment as, for example, Oxford does; and third, most university departments are not packed with world-class academics working in cutting-edge facilities.

We think it seems logical to consider the latter as an important research gap to address: the study of the local role of an HEI with more limited aspirations than the world-class universities typically analysed in the literature. That would mean to study also those agents key to the evolution of a university's roles in the local context, concomitantly underlining the university's different mechanisms of interrelation with its environment, which predominantly has been characterised by the presence of low-tech industries. Such an analysis would add more empirical insights to understand the numerous roles that certain kind of HEI, neglected so far by the literature but still predominant in Europe, has played throughout its, on occasion, more than hundred year history. In this

regard, the study of a detailed historical evolution would also facilitate the adaptation of educational and local development policies to regionally-based institutions and needs, beyond one-size-fits-all policies.

Achieving this aim will entail mapping out how a local innovation system has evolved, and how its institutions of higher education have been positioned within it. Since the local innovation system approach has stressed *knowledge* as a crucial factor to include alongside the classical production factors (land, capital and labour), this perspective can more easily accommodate to our principal object of study: the evolution of an HEI's local role. Therefore, the present thesis will attempt to address this gap by answering two main questions:

1. How has the role of an HEI evolved in a *low-tech context*, including changes in its interactions with society at different levels (local, regional, national, international)?
2. How does the role of the university personnel evolve, according to its social context?

To address these two questions, the integration of two different study fields is required: first, the analysis of the changing role of the HEIs, and second, the study of the dynamics of knowledge generation and dissemination within specific local contexts. Empirically, the study is focused on an institutional-level analysis, adopting a bottom-up perspective from the university to the system overall. For instance, while most studies implicitly assume that all the actors located in a region are relevant to the system, we have only paid attention to those who actually are (or have been) related to the university. This way we can also analyse the evolution of the types of mechanisms

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that have contributed to the development of different (actual) actors at different levels from an innovation standpoint. Our strategy is not to take the local area chosen as a local innovation system for granted, but to explore how the university has contributed *to its development*.

CHAPTER 3. “HOW” THE STUDY IS
CONDUCTED: CASE STUDY AS
METHODOLOGY

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METHODOLOGY

A case study is a story about something unique, special, or interesting (Neale et al., 2006: 34).

According to Neale *et al.* (2006) a case study is a comprehensive description of a given phenomenon, but from a novel perspective. In the same vein, the principal objective of the present thesis is to study the evolution of the different linking mechanisms from HEI within a milieu that has been defined as an industrial district or cluster, but studied using mainly the local systems of innovation approach. The present case study addresses an example of a type of geographical area neglected by the literature about the changing role of HEIs. This literature has traditionally exhibited two primary aspects: first, a focus on *success stories* such as entrepreneurial universities located in high tech regions (e.g. Silicon Valley). Second, the analyses of some authors (Etzkowitz, *et al.*, 1998; Etzkowitz and Leydesdorff, 1999; Etzkowitz *et al.*, 2000) reveal an inclination towards a “universities’ evolution from ivory towers to entrepreneurial universities” (Plechero, 2007: 24). We argue that this trajectory is an oversimplification and it does not exactly apply to some environments where the HEIs have maintained links with industry since almost their inception. Our purpose is to demonstrate HEI’s relevance in low-tech contexts directly related with some specific local knowledge dynamics. With

the case study methodology, we will be able to offer a more complete picture of the previous research questions posed above. To answer the first question I will map out where specific HEI faculty members have established their current activities (inside and outside academia), and the second question will be addressed by analysing the different paths of interaction that specific knowledge domains of a Spanish polytechnic have opened up with the institution's environment during the period of study.

This empirical analysis has been based on the assessment of the qualitative aspects to build case histories by collecting stakeholders' opinions and narratives and by analysing institutional documents and other related studies about the HEI under consideration and its context. According to Yin, building case studies through qualitative analysis is fundamental to obtaining a whole perspective of the phenomena, and to subsequently comprehend the relations between these phenomena and the *context* (Yin, 1994). Our case study has included different data collection techniques (i.e. interviews, document analysis and observation) which hope to provide a more complete picture. However, this methodology is not free from pitfalls: it "can be lengthy," (Neale *et al.*, 2006: 4) and thus, the researcher has to ensure the readers are provided with enough details, but not too many as to confuse them; and he must not only present findings but also has to capture and maintain the readers' interest by weaving these data into an original narrative. Nevertheless, care must be taken when generalizing. This is one of the most popular criticisms of qualitative studies. A sensible way to avoid this problem is to firmly anchor the research questions to the literature employed (not to the replication of the phenomena in other settings). Additionally, generalization is not possible in all cases, so this issue must also be taken into account according to Yin (1994).

During the first steps of the research, the objectives are "tentative". Despite the possibility of changing them throughout the research process, "they serve to guide and initiate discovery". New insights into the research problems posed are expected, thereby offering an alternative picture. The researcher thus becomes an invested interpreter for a distant observer (Andersen; 1995; also cited in Martínez Vela, 2007: 35-36)

3.1. Selection of the Case Study

Alcoy is an excellent example of the kind of local context that has not been sufficiently examined with regard to the role of the HEI in a local system. The city is located in a peripheral region (the Valencian Community) and the nearest metropolitan areas are *Alicante* and *Valencia* (approximately 50 km and 100 km away, respectively). *Alcoy* belongs to the province of *Alicante*, although part of the county (*L'Alcoià*) belongs to the province of *Valencia*. This fact reveals that the administrative delimitation does not exactly correspond exactly to its functional demarcation. Historically, the Valencian Region has been made up by three provinces: *Castellón*, *Valencia* and *Alicante*. However, for a brief period in the 19th century, there was a fourth province, *Xàtiva*, which was partly absorbed some years later (1833) by the provinces of *Valencia* and *Alicante*. Since the 1990s, a debate has taken place about the creation of a functional space where this intermediate territory would have the possibility of forming an administrative unit independent from the capital cities of *Valencia* and *Alicante*. This fourth province has been tentatively received different labels, such as Valencian Central Districts (VCD), *La Muntanya*, *La Contestània* (Piqueras-Haba, 2002), the first of them being the most common. However, there still remains a problem: which counties are to be included within these Valencian Central Districts? The question has not fully been

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answered (Tormo, 2011), since different authors and studies follow different criteria for their demarcation. For instance, the OECD (in conjunction with some UPV researchers) undertook a project (OCDE, 2001) to set out new districts. The result was a new map where the VCDs included 6 counties (*L'Alcoià, El Comtat, La Vall d'Albaida, La Costera, La Safor* and *La Marina Alta*). However, other bordering districts, such as *l'Alt Vinalopó* or *La Canal de Navarrés*, have also been included in other studies (Masiá-Buades, 1999). The problem with this ambiguity in the process of district demarcation is nothing new when one bears in mind the different objectives of the different studies, as well as the political motives of each. According to Tormo (2011) the main goal pursued by the different proposals throughout the 20th century has been “to establish an agreed map of districts to face the centralism imposed by the provincial delimitation” (ibid: 16). The problem is that for some actions there is a need for a geographical delimitation smaller than a province but bigger than a city or town.

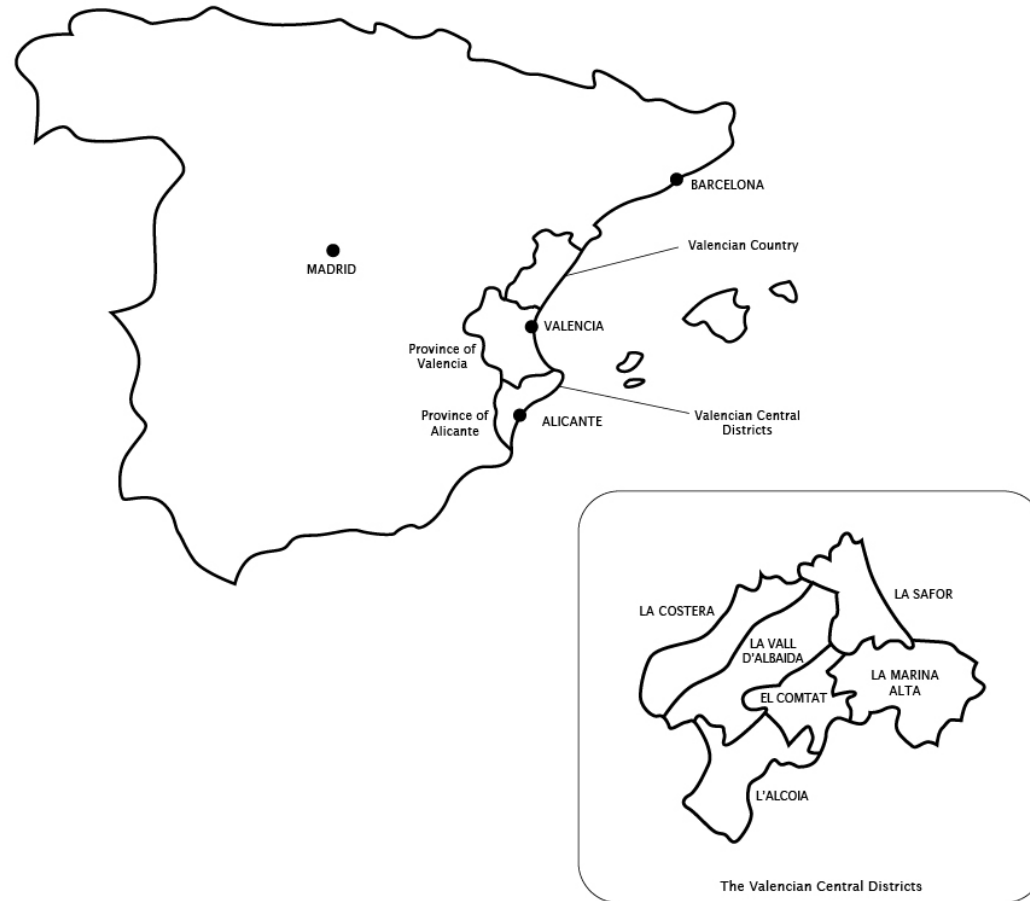
In our study we focus mainly on the counties which first have been historically included into the category of the VCDs; and second, we expand the influence area of the HEI according to the perceptions captured through the interviews conducted with the main representatives of the HEI under study. This comprehensive decision is based on the evidence that the role or the influence of the Alcoy's HEI is not static and requires a proper contextualization. For instance, as most of interviewees argued the influence area of the HEI has to take into account several issues. The first one is related to the industries that are located in the area, mostly based on the textile, paper and metal industries. As there has been no institution of higher education that offers a type of very specific studies on industrial engineer, the area of influence where it ends eventually delimited the area of influence of another higher education institution that offers a range

CHAPTER 3. "HOW" The Study is Conducted: Case Study as Methodology

of courses like. In this case, the catchment area to the north ends in the area of *Xàtiva*, where begins the area of influence of the Polytechnic University of Valencia, located in the capital of the region, Valencia. On the other hand, if we restrict the catchment area to the south, it terminates at the Alicante metropolitan area, but this is so since 1971. In that year, he created the Polytechnic School of Alicante, which although offers thereafter engineering studies, it is also true that this HEI Alicante lacked the experience or level of expertise accumulated over more than one hundred years of the School Industrial de Alcoy. Therefore, we can say that until the 1970s the area of influence was greater, because in Spain there were only three referral centres in textile engineering studies: in Béjar, in Tarrasa, and Alcoy. However, we think that, despite being one of the three reference canters state-wide in textile engineering studies, we must also be wary of this type of boundaries as almost late twentieth century communications in this area were very complicated and with a difficult access. Therefore, the decision remains valid confirming that the catchment area is mainly restricted to the aforementioned VCDs.

Another factor to consider when defining the area of influence of the HEI is the integration of its graduates in the local industry, that is, its local labour market. Thus, it is also confirmed by the interviewees during the research process that the VCDs match the target of HEI graduates of Alcoy.

Figure 2: Map of Valencian Central Districts



Source: OECD (2001)

3.2. Level and Unit of Analysis

The case study focuses on a particular HEI from a historical perspective, analysing its evolution in terms of the internal and the external changes, in a context characterized by the dominance of traditional industries. The web of relationships with the environment are analysed in a broad, inductive manner, taking into account the questions that have been contemplated in the literature and the issues arising from the case study itself.

Our study is based on the analysis of individual stories (university managers and academics). We have decided not to include people from industry. However, most of the interviewed people have worked at or for the local industry, so they can also answer questions about the industrial context¹². First, the university managers were interviewed to map out the institutional evolution of the last thirty years. Second, *academics* (from two different knowledge domains: engineering and management) were studied as a starting point for tracing out their web of relationships (internal or external; local, regional, national or international; informal or formal; and direct and indirect) with other agents (i.e. firms, technology institutes, governments at different levels and industrial research organisations). With this analysis, we have been able to offer more empirical insights to the local systems of innovation approach in terms of the contributions made by a polytechnic to a low-tech milieu.

¹² For a more detailed study about the industrial managers' perceptions about the HEI contribution to its local context, we should initiate a new research project, which could obviously complement the current results obtained on this thesis.

3.3. Research Techniques

There are different established ways of conducting case studies. The present work follows a guide suggested by Neale *et al.*, (2006) and additional recommendations offered in Coller (2005). The general process has consisted of four phases: 1) planning or designing the research, 2) collecting data or field work, 3) analysing data, and 4) disseminating findings and writing the report.

The first action included in the planning (research design) phase was the researcher's identification of some of the key potential interviewees. They were divided (by the researcher) into specific levels:

- *Institutional/Managerial level (university managers)*: University managers were asked about the principal shifts in university governance, new roles in management, etc. Afterwards, this information was contrasted with several official documents, such as, strategic plans or annual reports. This analysis allowed us to identify the principal *periods* of the HEI's historical evolution. Within the figure of *university managers*, we include different managers, including rectors, directors and technology transfer officers. In total, we interviewed nine people within this category who were in positions such as university rector (one person), university director (four people), department director (two people), and also interface structure directors (two people).
- *Academic Level (academics)*: The main *incentives* and *motivations*-- and the way they have changed overtime-- were analysed, in addition to the *activities* undertaken by the academics. These activities were differentiated between

Chapter 4. The Empirical Study: Results

academic activities (teaching and research) and extra-academic activities (relationships with their socioeconomic environment). After the analysis, the future lines of action of the HEI under study were drawn by asking these academics about their *perceptions* of their confirmed and potential contribution. Within this category, we interviewed nine academics from different disciplines such as business administration (two people), textile and paper engineering (three people), telecommunications engineering (one person), mechanical engineering (three people).

- *Key interesting individuals (with a historical overview of the institution):*

Throughout the research process, we left room to include any person who was considered as essential (*snowball technique*). Within the category of *Key interesting individuals*, we included only three academics and a HEI manager that were not included at the beginning of the study. Among these people we would like to stress the interview conducted with one retired person¹³ who was in charge of the Secretariat of the Industrial School of Alcoy, not only during the dictatorial period in Spain, from 1960s to 1970s, but also at the beginning of the democratic transition (1980s). He was a key (alive) person to elucidate the local role of Industrial School of Alcoy throughout the dictatorial period which nobody has studied, according to one local historian that was asked. A short description of his profile (see Appendix 4) can shed light about the way this kind of people face his everyday duties at the Industrial School.

The next step was to develop the interview protocols: the rules that guide the administration and implementation of the interview. First of all, the interviewees were

¹³ That person was identified thanks to follow the snow-ball technique during the interviews.

informed by the researcher through an invitation letter about the project, the content of the interview and the way it would be conducted. We ensured that the research would take into consideration the ethics research standards. This issue was crucial for building trust with all the interviewees and each was informed by both letter and at the beginning of all the interviews.

The researcher also developed an interview guide for each group of stakeholders (questions differed slightly for each one) that listed the questions or issues to be explored and included an informed consent form. Once the instruments and protocols were well established, and before conducting the interview, the researcher refined the process of conducting the dialogues. Before leading the first interviews, two leading experts were consulted to confirm whether the first tentative proposal could be undertaken (feasibility), and in which sense it should be addressed (validity). After the interviews, the next steps were: first, to review the interview data and second, to collect and review all the relevant documents that were proposed to include in the analysis by the interviewees. Examples of these documents were the Strategic Plans of the HEI, some historical documents that revealed parts of the aims pursued by HEI's members, and some annual reports of the HEI.

The last steps of the research process were to obtain feedback from the interviewees by soliciting comments on a report based on the interview programme and produced for this purpose. Finally the researcher disseminated the first draft in different fora (seminars, meetings, workshops, etc.) in order to discuss the results.

3.4. Personal Background

My field of interest and also my experience in previous research projects are reflected in the way I have conducted this study. My collaboration in 2004 in the development of the Strategic Plans for the Valencian Textile Districts allowed me to become familiar with the analysis of industrial agglomeration by working with key concepts like *cluster* and *industrial district*. The nature of the aforesaid study and its objectives implied the analysis of different agents collaborating in a specific geographical area, but from a strategic point of view. This required proposing new ways of action for the different municipalities that participated in the project.

Obviously, I acknowledge that my personal experiences have shaped my way of thinking. For example, I was born in *Alcoy*, the city where today a branch of the UPV is located and where the industrialisation process has induced great transformations throughout its long history. Active participation in university activities led me to be involved in some university projects as an assistant. My experience, for instance, as an assistant in the Employment Area, and in its elaboration of the Quality Assurance Self-evaluation, was extremely useful for my future interests and concerns. Without them, I would have never started the PhD process, nor would I have selected this topic and this case study.

CHAPTER 4. THE EMPIRICAL STUDY:

RESULTS

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RESULTS

This chapter focuses on three periods, analysed in four subchapters. The structure is aimed to face the challenge of not only presenting a historical sequence of events, but also considering the different levels, actors and their interrelationships, following a systemic approach. Subsection 4.1 will introduce the reader to the context under consideration; the subsequent sections will delve into the development of the institution's role across three sequential stages. First, section 4.2 deals with the period between the creation of what became the predecessor of the current local polytechnic school, and its subsequent integration with the *Universidad Politécnica de Valencia* (1828-1972). Second, section 4.3 analyses the period from the 1970s to the telecommunications boom of the mid-1990s. The current roles of the HEI over the last fifteen years are discussed in section 4.4, focusing on the institution's increasing number of collaborative mechanisms. Finally, the perceptions of the university members on the future of the university are reflected in section 4.5.

4.1. Background and the Local Context

The so-called *Valencian Central Districts* belong to two different provinces of the *Comunidad Valenciana*: *Alicante* and *Valencia*. They do not form an autonomous administrative region, but rather a functional one. They are linked together by historical, socioeconomic and cultural ties. First, over the 19th century, they formed the old circumscription of *Xàtiva* (the so-called fourth province of the *Comunidad Valenciana*

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region, in addition to *Castellón, Valencia* and *Alicante*). In economic terms, the area of the VCDs is dependent on *Alcoy's* industrial development and on those of its surroundings (namely the towns of *Ontinyent, Banyeres, Muro* and *Concentaina*). Second, these cities specialise in industries revolving around the textile sector. That is why the underlying dynamics of socioeconomic development have suffered powerful fluctuations attributable to the cyclical problems in the textile industry since the 1970s, or even earlier. Third, the complex task of attracting and maintaining highly-skilled workers has been a common concern within this area, and also linked to the inherent difficulty in diversifying towards other activities beyond textiles (OCDE, 2001). Fourth, a deficient infrastructure endowment, in terms of communication and services, has traditionally characterised this set of municipalities, though an improvement has been observed over the last ten years (ibid). Fifth, there has been a slight and continuous population growth throughout the 20th century. Sixth, a population exodus from the rural areas to the industrial cities took place during the early stages of the industrialisation process, though job possibilities in places like *Alcoy* or *Ontinyent* (the two main textile centres) continuously attracted a rural workforce, above all between the 1950s and 1970s. Finally, we must not forget the increase in the presence in the area of a foreign workforce that has typically filled low-skilled jobs ACC (2007).

Over the 19th century, a process of industrialisation took place in *Alcoy*¹⁴. The origin of this process is often attributed to numerous factors (Gabinete Sigma, 1974). First, while the municipality encompassed thirteen thousand hectares, opportunities for growth were

¹⁴ This process of industrialisation has been the object of study by different local historians. See more in Aracil & García-Bonafé, 1974; Gabinete Sigma, 1974. Indeed, their analyses have served as a reference for historical Valencian studies conducted since.

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limited as only two thirds of these could be cultivated. Second, the area's bountiful sources of water allowed not only for the exploitation of the limited arable land, but also power generation and, subsequently, the installation of the first factories. Third, a very cheap and abundant labour force was readily available from the surrounding countryside to carry out the operational tasks of the production process. A final relevant, though critical, factor in the emergence of industry in *Alcoy* can be attributed to some wealthy landed families from the outlying rural areas who invested their capital in the city with the aim of diversifying their holdings.

Alcoy's the textile industry is among the oldest in the Spain. Additionally, the utilisation of mills for other ends, such as paper manufacturing, had already been witnessed early on (at the end of the 18th century). This process of innovation relied on diversifying the use of mills beyond textile manufacture. In *Alcoy*, a priest, who was additionally an industrialist, implemented mills for the paper industry, which then provided packing material for the textile products (Gabinete Sigma, 1974). It was precisely these two industries-- textile and paper-- that propelled others: metallurgy, for example, thrived due to the continuing need for repairs to the machinery dedicated to textile and paper manufacturing. Examples of well-known metal factories can be found in the holdings of two local bourgeois families of the 20th Century, the *Mirós* and the *Rodes*. Essentially, these three sectors represented the principal engines of local economic development until almost the present day. In addition, many small, family-owned shops and workshops made up the rest of the economic landscape.

In terms of economic structure, the most representative sectors in the area today are: textile, toys, plastics, metallurgy, glass making, food products, chemicals, machine manufacturing and electronic and electrical equipment and components. Nevertheless,

more important than the aforementioned industries is the services sector, comprised of information technology services, industrial design, small-scale commerce, banking, healthcare and other professional branches (SABI, 2011).

Towards the end of the 21st Century, most remaining firms started to diversify their activities, principally towards the building sector, not only due to the short term benefits foreseen, but also because institutionally there was a strong support to such an end provided mainly by government (at all levels) and by the banking sector. It should be noted that the present economic structure is the product of an evolution over the past three decades. Over this period of time, the building sector experienced a dramatic boom, which continued until the global economic crisis of 2008. This growth was due not only to the building sector as such, but also to the related sectors that supported it, both upstream and downstream (namely, banking and real estate) (Golf-Laville & Ortega-Colomer, 2012).

4.2. The Local Role of an Alcoy HEI until its Integration with the Universitat Politècnica de València

Within the context briefly described in the latter section, the role of the industrial school, predecessor of the current UPV departments in Alcoy, was very important. The industrial school was the organisation aimed at providing the technical knowledge to the local workers, the only one in the area, and therefore, such as a local historian interviewed for this study summarizes:

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All the business networks were originated there [in the industrial school], all their members studied there, and moreover they were engaged in collaborative projects with their teachers, who simultaneously were also industrial managers of different local factories through a continuous friendly contact with them (Interview 15, 2009).

In broader terms, this has been the descriptive characterization of the industrial school by all the interviewed people throughout the research process, but in this section we will strive to explain the different roles that it played until its integration with the *Universidad Politécnica de Valencia*.

Taking into account that the local industrial school is part of what we could name the local innovation system we will highlight its different contributions to the local economy from a historical perspective. To this end, for example, it is interesting to note a summary provided of the official names of local HEIs, their objectives, their activities, their scopes and their funding systems (see Table 3). All the information has been extracted from the research of a group of local historians (Aracil & García-Bonafé, 1974; Gabinete Sigma, 1974; Nadal-Blanes et al., 1997; Blanes-Nadal et al. 1999) and complemented by interviews conducted by the researcher as part of the present study. Additionally, several official documents, such as, “memories of celebrations” have also contextualised the different contributions of the HEI to the cultural and socioeconomic context.

As we already mentioned, throughout the 19th century, an expansion of the industrial sector (mainly the textile industry) took place in *Alcoy*, in parallel with other European industrial cities. However, given the absence of a particular state funding system for industrial education, as previously noted in the previous section, the local industrialists of *Alcoy* initiated a set of negotiations with the local and central government in order to

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create a technical HEI, and thereby allay their fear of losing their position *vis-à-vis* their domestic and foreign competitors. Indeed, the *Real Fábrica de Paños de Alcoy* was the institution responsible for the establishment of the *Establecimiento Científico-Artístico* in 1828, the predecessor of what later became the industrial school, usually named as *Casa de la Bolla*, due to its distinctive way of "marking" their textile articles.

The *Real Fábrica de Paños* of Alcoy was established in 1731 by a group of leading, early, "industrialists". Its initial objective manufactured the clothes and uniforms that were used by the Royal Army of the King Carlos IV of Spain and in continued to supply the Spanish armies for decades to come. The *Real Fábrica de Paños* was a key piece within the industrialisation process in Alcoy, and it was the centre of the continuous efforts to update the technological capacities of the local industry from the late 18th century. In 1829 this organization founded the first "School of Textile Industry and Scientific and Technological Culture" of Alcoy, which was named *Escuela de la Bolla*. This educational institution was later established in 1854 as a public-sector organization, funded by local and provincial budgets, under the name of *Escuela Industrial*. This was one out the three first educational institutions created in Spain for similar purposes. The mechanisms this organization used to provide the technological capacities to local firms were three: 1) hiring foreign technicians as lecturers, 2) by buying new machinery to be used in its labs and teaching facilities and 3) by sending local masters to learn the main innovations not only in the use of new textile machinery but also in the generation of new textile and chemical processes (Interview 2, 2011). In general, skilled labour in the textile and related industries was very scarce, and in particular, there was a scarcity of capacity in organic chemistry, not only in Alcoy but

throughout Spain. That is why it was easy for the technicians trained at the school to find a job in Alcoy or its surroundings (Interview 15, 2009).

Since the creation of the first technical educational institution in 1828, two Higher Education Institutions predominated over the *Alcoy* sphere of education until the 1970s. On the one hand, the *Escuela de Peritos* (and later *Ingenieros*) *Industriales*, which is considered the forerunner of the current Campus of *Alcoy* – *Universidad Politécnica de Valencia*; and on the other, the *Escuela de Artes y Oficios de Alcoy* (*EAOA*), devoted since the late 19th century to providing a practical education and focused on workshop-based positions, such as graphic designer, illustrator and lathe operator (Mestre-Moltó, 2008). Our study focuses only on the former HEI, the Industrial School of *Alcoy*. Indeed, the *EAOA* has been already analysed from a historical viewpoint in Mestre-Moltó (2008). At this book, the author describes the origins and subsequent development of this vocational school which was funded by local and provincial governments “as a response to the inadequate education legislation that existed at that time for theoretical and practical training as well as technical and artistic education of the workers and craftsman” (Mestre-Moltó, 2008: 9-10). Likewise, the relationship between *EAOA* and the Industrial School was found out by Blanes-Nadal *et al.* (2000), from a testimony of who was then its director:

The worker in the schools of arts and crafts searches for the practical know-how to the rule, but no scientific basis. This, as essential to the progress of industry is possible only by teaching it in our schools where, step by step, and a succession of academic courses, logically chained and force a row, you get to acquire the knowledge necessary to run, reasoning, and implement change in industrial matters and procedures (Blanes-Nadal *et al.*, 2000; also cited in Mestre-Albert, 2008: 50).

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Apart from these educational institutions, several training colleges also offered specialised technical education to factory employees. The following table summarizes the chief milestones in the history of *Alcoy's* HEIs: their respective evolution can be perceived in each period as many employed different names for the same local HEIs, concomitant with their changing degrees, funding and scope.

Table 3: The Official HEIs in *Alcoy* during the 19th Century

Period	Name of the Centre	Degree Offered (around 3 years)	Funding Source	Scope
1828-1853	<i>Establecimiento Científico-Artístico</i>		Local Government and private funds	Local
1853-1901	<i>Escuela Industrial Elemental de Alcoy</i> (This institution began operating as such in 1855 due to certain administrative difficulties.)	<i>Industrial Expert</i> (<i>Perito Industrial</i>)	Local Government and private funds	Local National, from 1877 to 1901, due to the existence of only one HEI with these features.
1886	In parallel to the existence of the <i>Escuela Industrial</i> , the School of Arts and Crafts of <i>Alcoy</i> is established in 1886	<i>Industrial Expert</i> (<i>Perito Industrial</i>)	Local Government and private funds	Local And also National, from 1877 to 1901, due to the existence of only one HEI with these features.

Source: Own elaboration from Blanes-Nadal (1999) and Interviews 2, 15 and 18.

Table 4: The Official HEIs in Alcoy during the 20th Century

(1901-1902) – 1907	<i>Escuela Elemental de Industrias de Alcoy + Escuela Superior de Industrias de Alcoy</i>	<i>EEIA: Technical (lower than Experts) ESIA: Mechanical, Chemistry and Electrical Expert. In 1902, Textile Expert, and in 1907, Quantity Surveyor.</i>	Local Government	Local
1907-1928	<i>Escuela de Industrias de Alcoy (merge of the two previous schools)</i>		National Government (and Local)	Local
1928-1942	<i>Escuela Elemental del Trabajo de Alcoy + Escuela Superior del Trabajo de Alcoy</i>		State	Local
1942-1964	<i>Escuela de Peritos Industriales de Alcoy</i>	Mechanical Expert. Electrical Expert, Chemistry Expert y Textile Expert.	State	Local
1964-1994	<i>Escuela de Ingeniería Técnica Industrial de Alcoy</i> (In 1972, this School is integrated within the <i>Universidad Politécnica de Valencia</i>).	<i>Engineer</i> Disciplines: Mechanics, Textile, Chemistry, Electrical and Electronics In 1992, Telecommunications	National (and also Regional) Governmental Bodies	Regional

Source: Own elaboration from Blanes-Nadal (1999) and Interviews 2, 15 and 18.

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The first industrial-era HEI in Alcoy, the *Establecimiento Científico-Artístico*, deserves particular consideration as its origins are closely connected to the industrial reality of that moment: some of their founders belonged to the main industrial families of the town. They were convinced of the importance of giving workers a technical education to better anticipate technological change in the industry. The initiative of founding the *Establecimiento Científico-Artístico* -- considered the oldest antecedent of the current Campus of Alcoy (UPV) -- came in 1828 through the financial support of both the *Real Fábrica de Paños de Alcoy* and the local government - which was composed also by local industrialists. Until that year, RFPA was the main textile provider of the Spanish monarchy, but over time its role shifted to later become an employers association, defending the interests of the local textile industry. The objective of this fledgling educational institution --the *Establecimiento Científico-Artístico*-- was primarily “to train technicians who, after a theoretical and practical preparation, were able to competently manage the different sections of a modern mechanized weaving factory”¹⁵ (Blanes-Nadal *et al.*, 1997: 7, translation mine). Teachers also served to meet firm-based knowledge demands from early on, particularly in two fields: chemistry and mechanics. For instance, they disseminated the latest technical knowledge and techniques through their teaching, in parallel with the introduction of updated bibliographies on their subjects. In fact, the first two privately-funded *Cátedras* (Chairs) were in these two disciplines --Mathematics and Applied Chemistry-- and their creation was possible thanks to a renowned industrialist's inheritance: Francisco Tomás Gosálbez (Colomina-Francés, F. J., 2000:19). Additionally, to meet the increasing

¹⁵ “El seu objectiu era clar: Formar tècnics que, després d'una preparació teòrica i pràctica, foren capaços de dirigir competentment les distintes seccions d'una fàbrica de teixits moderna i mecanitzada” (íbid).

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energy demands of factories beyond water-driven machinery, one of the most important challenges faced by faculty members of this new HEI was to seek out mineral deposits (e.g. coal) from the neighbouring areas.

A few years later, in 1853, the *Escuela Industrial Elemental* was established (Blanes-Nadal, 1999), though it did not open until two years later. An additional -- and critical -- incentive for founding this educational institution was the prohibitive cost of sending workers to foreign countries (such as France and England) for training. In parallel, scholars and foreign experts with sufficient knowledge to teach the workers were attracted by the industrialists of that time who funded their stay at Alcoy, together with the local government financing support. Industrialists were fearful of losing their competitive position in terms of the quality of their products, so they adopted a proactive--and self-interested--approach by creating a technical school, thereby taking advantage of the increased teaching resources available. It is also important to underscore the dependence of local firms (mainly textile and paper producers) on machinery providers and chemical products from abroad. The first incorporation of continuous listing paper machinery and Jacquard looms took place in the 1880s: this importation vaulted the town of *Alcoy* to levels of technological competitiveness comparable with the principal Spanish industrial centres of the time. At that point, a critical mass of metallurgy began to emerge, adapting the foreign technology to the local production processes.

In general, the *Escuela Industrial Elemental de Alcoy* was a small educational institution (in terms of numbers of students and staff) until the decade of the 1980s, when it started to grow considerably. It was not until the start of the 20th century that education funding was assumed by the state, as other European countries had, hence

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relieving (somewhat) local governments and business associations of their economic onus. Until then, there were between 50 and 150 individuals at a time, on average, including teachers and students. The latter had to be at least 12 years of age when they entered the *Escuela*. Their attendance was voluntary and there was no limit to the number of years of study. This is understandable, since the student body was comprised not only of young people who had the luxury of dedicating themselves full-time to studies, but also of adults studying in tandem with arduously long workdays and low salaries. For the same reason, the school functioned mostly at night. The students should have believed that, despite their exhaustion after twelve-hour workdays, a better education could offer opportunities for higher-paying jobs within the local area. In fact, the scope of this kind of school was primarily local (Blanes-Nadal, 1999). Its personnel, in turn, combined their teaching activity with others. For instance, some teachers had their own firms, while others were employed in a local production plant; meanwhile, others were engaged in local government. This aspect is noteworthy, since it clearly represents the fluidity of institutional divisions at that time. However, as one interviewee noted, an educator's interest in interacting with the industrial environment was a *conditio sine qua non* for survival: teachers consistently received irregular salary payments and, therefore, were obliged to seek out supplementary income (Interview 15, 2009). Moreover, it should be remembered that, despite the economic expansion of *Alcoy* during that period, poverty remained endemic and the communications limited (roads traversing the surrounding hills were consistently in desperately poor condition) (Gabinete Sigma, 1974). In order to attend to those workers in precarious conditions, the industrialists and the Church jointly created the *Círculo Católico de Obreros* in 1875. A few years later, and defending the same causes, in 1880 a new social organisation emerged – *La Sociedad Cooperativa "El Trabajo"* – this time composed

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of non-Catholic workers and devoted to, among other things, assuring them a regular payment in the case they fell ill. The cooperation of these two opposing organisations overrode the ideological differences of two different groups of workers. The former were much closer to the industrial class and the Church, while the latter were part of the leftist Internationalist and Luddite movements in *Alcoy*.

All these endeavours were carried out mainly by the industrialists and required financial instruments, largely provided by a local savings bank founded in 1875: *Monte de Piedad y Caja de Ahorros de Alcoy*. This organisation then merged with other local savings banks, due to the increasing need for capital, and remained until almost the present day the central financial organisation for the whole local system. Of course, it was likewise intimately linked to the main actors of the local system: the industrial head managers and the most powerful families who controlled the principal local decisions.

The general outlines have been laid out for the story of how the industrialists were behind the creation of a school to train technicians. Although this model of technical training was spreading throughout Spain as an idea, there was, surprisingly, only one *Escuela Industrial Elemental* in all of Spain, located precisely in the municipality of *Alcoy*, from 1877 until 1901 (Blanes-Nadal *et al.*, 1997: 8). This fact offers a glimpse of the importance of the town of *Alcoy* during this period of industrialization in Spain (Aracil & García-Bonafé, 1974; Blanes-Nadal *et al.*, 1997). Nevertheless, due to enrolment limitations, on numerous occasions the local business community attempted to circumvent this “middle man” and train technicians directly within their own teams. Technical training was so important for the firms that industrialists launched their own training programmes whenever they found the established schools were unable to supply the level of trained personnel they needed.

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Throughout the first half of the 20th century, the composition of the local innovation system in the area of Alcoy was dominated by few actors belonging to the local government, the family-owned industrial firms and the industrial school. The connections with foreign organisations were circumscribed to these few people who controlled the main political and economic decisions. According to the testimonies extracted from the interviews conducted, the role played by the Industrial School throughout the period of this stage (from 1850s to 1970s) remained almost stable, despite of the profound changes at societal, cultural and economic level (Interview 2; Interview 8 and Interview 15). The early stages of the Industrial School covered a period that, for instance, was marked by the imposition of two military dictatorships, first of Primo de Rivera, and then that of General Francisco Franco, if well with each observed a short time in which the Republic was proclaimed. In this sense, the great social, technological and economic developments might not give to the entrance of democracy from the late 1970s, where we have fixed the beginning of another stage within our historical analysis of the HEI under study (see section 4.3.). Among the very few studies on this period we could interviewed a retired person who was in charge of the Secretariat of the Industrial School at that period (see Appendix 4). He explained that during the years 1940-1960, industries were required by law to allow employees to enjoy two hours of leave. This way, employees could attend the *Escuela Industrial* to upgrade their skills. It should be noted that, at the time, employees worked every day except Sunday, a day for rest and attending church. In that sense, industrialists were demanding reforms to accommodate the legal and political framework to the new labour realities of the day, which required a higher level of skills and competences in order to provide higher quality to the products and processes (Nadal-Blanes, 1999).

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To summarize, the period from the creation of the first Industrial School (1828) until its integration with the *Universidad Politécnica de Valencia* (1972) was one marked by a clear division between the rich families who controlled the different local institutions and the workers who were upgrading very slowly their working conditions and their skills. Hence, we can observe a very solid bourgeoisie that was not only linked to the most important industry at that moment, but was also in charge of many public bodies, such as the local government and the industrial school of engineering, and private ones, such as the *Monte de Piedad y Caja de Ahorros de Alcoy* (a local savings bank). Apart from this group, very few people enjoyed a reasonable living standard; a great part of *Alcoy's* population was living precariously, with few links with the principal local institutions, except the link of the factory worker with his or her employer and with the Church. In that sense, although we can affirm that the HEI had fluid relationships with government and industry, if we look at the whole *system*, we find a part of the population demanding better working conditions, but limited to the periphery of the decision-making processes, controlled mainly by a coterie of rich families. Moreover here it is important to differentiate three figures in order to understand the peculiarity of the existence of fluid relationships between the teaching staff and the local industries (Interview 8, 2013). First, the figure of *Catedrático* is characterized for being in charge of organizing the academic life of the institution, a task which entails distributing the teaching load, managing new hires, including processing payments to teachers. Concomitant to these academic duties, the *Catedrático* usually works for a local firm, mainly as a technician, and very rarely is the owner of the firm (Interview 8, 2013). In that sense, the crucial detail is that the relationship is not undertaken at the institutional level, but rather at personal level, since the HEI does not have any record of the different kinds of collaboration mechanisms between the *Catedrático* and the firm. The

kind of projects developed jointly between the *Catedráticos* and the local firms are based on *quality assurance* projects and consultancy works, and most of times students are involved informally to develop a part of the project within such projects (Interview 18, 2010). However, as one current *Catedrático*, who was a student during the 1960s, told us these works are hidden to any kind of empirical scrutiny, because of the informal nature of the relationship and the inexistence of any record, so we have only this information based on a single testimony. The second figure we have found out relevant to understand the relationships between academics and industrialists is the Chartered Teacher. This teacher is a professional, mostly an engineer, who, apart from being a full time teacher, develops legally engineering projects, again with the help of a student who is appointed informally by the professor in order to develop a part of these projects informally. The informality here is meant as a relationship without a legal contract or agreement between the university and the firm (Interview 6, 2009). The Chartered Teacher then combines both activities, but the HEI is not either aware of the external activity that he/she undertakes. This way, there are not pecuniary rewards or acknowledgements from the HEI side. The benefit observed is the experience shared by the teacher at the classroom to the student, and even the knowledge and practice acquired by the latter. Lastly, the third figure to highlight is the part-time lecturer whose main activity is not academic. In this sense, he plays a similar role than the full time teacher, but to a lesser extent (Interview 8, 2013). The most important fact to emphasise with the differentiation of these three figures is the confirmation of the existence of fluid relationships, but without an institutional support, which means that are hence personal and individual initiatives from academics, rather institutional actions.

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Looking at the external forces, we have to highlight the influences of the international sources for the machinery and chemical products needed in the primary industries of textile and paper. The external actors found in *Alcoy* a bustling municipality with three different social classes: a firmly-entrenched bourgeoisie, a pool of highly proficient technicians and an abundant (low-salary) workforce (Gabinete Sigma, 1974). On the other hand, the HEI personnel were in charge of adapting the external knowledge to the local context conditions.

Therefore, with the local innovation system approach, we find a very articulated system controlled by the bourgeoisie. However, there is still a part of this story, the working-class, which requires greater study and attention in order to understand the role it assumed within the local context. The only available sources of information are materials from the same HEI, and newspapers that were controlled by the same people. In this sense, the Industrial School of *Alcoy* played a crucial role within the local system, due to the complete technical services it provided to the industry through its staff of businessmen and people closely aligned to the sector. At that time, this supporting role was assumed uniquely by the Industrial School of *Alcoy* until the arrival of new players beginning in the 1980s on, such as consultancy firms, institutes of technology and others. And those changes were in parallel with a transition period where a merger between the *Alcoy* Industrial School and other Industrial Schools located in Valencia led to the birth of the current *Universidad Politécnica de Valencia*.

4.3. The Transition towards a Satellite of a Broader University

The birth of the first technical universities in Spain is in the 1970s. This new configuration of the university system was mainly due to several national legislative changes, which we now present. The August 4th, 1970 General Education Act, on Education and Finance of Educational Reform tried to reform the entire education system from elementary education to teaching university (Salaburu, 2007). The Act stated that the universities would be given more autonomy in terms of teaching and research, though this fact was hard to accomplish until later because of the pressure of the Dictatorship regime, which was finished in 1978. It also sought that universities assumed the management and administration of their centres and their services, which already largely happened in some industrial/vocational schools, and foresaw the incorporation into the university structure of Technical Engineering and Technical Architecture Schools. In that sense, both Polytechnics and Universities have been regulated by the same Acts. The Departments were established, so as the faculties, at the university system (Salaburu, 2007). The Departments were structured according to the respective knowledge area in which each teacher was ascribed. In the case of Alcoy, there were five main 3-years degrees in Technical Industrial Engineering: Mechanics, Electricity, Industrial Chemistry, Electronics, and Textile. The newly created Departments were the following: Department of Architectonic Composition; Department of Applied Statistics and Operations Research and Quality; Department of Applied Physics; Department of Construction Engineering and Civil Engineering Projects; Department of Electrical Engineering; Department of Electronics Engineering; Department of Graphics Engineering; Department of Hydraulic Engineering and Environmental Studies; Department of Mechanical Engineering and Materials;

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Department of Chemical and Nuclear Engineering; Department of Textile and Paper Engineering; Department of Heat Engines; Department of Applied Mathematics; Department of Continuum Mechanics and Theory of Structures; Department of Engineering Projects; and Department of Urban Planning¹⁶.

It is in 1972 when the *Universidad Politécnica de Valencia* (UPV) is established with the absorption of previous centres of technical education located in the region of Valencia, among which we highlight the Industrial School of *Alcoy*. At 1970s, there were very few technical schools at the national level, with such an extended professional trajectory as Industrial School of *Alcoy*. The newly created UPV thus emerged as an external force triggering a substantial shift in the governance structures of the *Alcoy* HEI, and bringing new linkages and capabilities to what had been until then a local educational/vocational institution. Among the principal changes that affected the university in the years that followed, the 1983 University Reform Act is especially significant because it gave definitely the desired “autonomy” in certain realms (Salaburu, 2007). For instance, it allowed the formalisation of relationships with the environment through contracts at the institutional level. The way the linkages were established, before the approval of this 1983 Act, was based on contracts at the individual level between professors and industrialists, and not on behalf of the university, as we explained in the previous section. The same happened with the Practicum for students, because it was the individual initiative by a Catedrático or by a Chartered Teacher, rather than the institutional one, the main trigger to enable the elaboration of a Final Project by a student together with a firm, though in an informal way.

¹⁶ My translation from UPV Alcoy website: <http://www.epsa.upv.es/departamentos.php?lang=es>

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Until that year (1983) Spanish universities suffered the typical drawbacks of a dictatorial regime: low levels of academic freedom¹⁷, transparency, and democracy. All these issues would be faced by the new Act, followed by the 1986 Act to promote and coordinate the scientific and the technical research. The university-industry linkages were not allowed until the promulgation of this Act, but surprisingly, Spanish universities had already witnessed not only how the government began to promote a series of practices that had just started to become legal, but also how this type of relationship (generally illegal until then) had curiously been the *raison d'être* for the existence of a centre that would be part of the recently established UPV: the Industrial School of *Alcoy*. In that sense, as stated in the previous section, *Alcoy* was special in terms of the linkages between industrialists and academics from the Industrial School, but it is noteworthy to highlight that the relationships were individual-based and not at the institutional level. As one interviewee affirmed, most of the professors were also technicians or even industrialists (owners) at the local firms, and thus there existed a fluidity of relationships between university and industry. The *Textile and Paper Engineering Department* has been characterised in the interview process as the most active in this kind of engagement with the local industry (Interviews 2 and 3, 2011; Interview 8, 2013).

The 1980s Spanish legislative changes also affected the tasks of professors who were required to spend more time on a wider set of activities. Apart of their teaching duties, academics were encouraged to conduct research and to work together with external

¹⁷ Despite of the increasing autonomy declared in the 1970 General Education Act, Spanish universities were controlled by the political authorities, so the autonomy proclaimed was not as effective as university personnel expected.

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organisations, such as firms, through collaborative projects. Two interviewees with a long expertise on the Alcoy Industrial School also stated that the most habitual kind of collaborative mechanism, before and after that Act, was based on tailored consultancy projects, such as chemical analysis, or professional advice about adaptations of the production process (Interview 3 and 8, 2011).

From the viewpoint of *context*, between 1972 and 1995 there was a significant increase in firm creation in previously-existing sectors, and likewise in certain emerging sectors (mainly electronics-based areas and services for small businesses). This allowed a greater range of choice and possibilities for the university to contribute to these emerging industries. Since the 1980s, there was also an increase in the number of students, which entailed a subsequent increase in both faculty and administrative staff. The latter was a new addition to the *Alcoy* HEI, as until then most administrative tasks had been undertaken by the faculty. The emergence of managerial bodies thus marked the beginning of the largest qualitative and quantitative changes in the history of the Industrial School of *Alcoy*, which would additionally continue expanding from the mid-1980s onwards.

In addition to their traditional teaching roles and under the influence of aforementioned legislative changes regarding higher education, the new teachers' duties incorporated research and service offerings to the professional environment (though both tasks were only *voluntary*, strictly). In fact, the reduction of paperwork due to the introduction of supporting staff allowed the faculty to engage in what were for them *new* activities: they could devote some time to research. Although the previous strong linkages with industry were increasingly fading away, they did not entirely disappear. The argument exposed by three interviewees was that "there were still teachers who worked at

factories or industrialists who were in charge of teaching some subjects” (Interviews 2, 3 and 8, 2011 and 2013). One main reason to this loss of university-industry interaction, according to those interviewees’ responses, has to do with the divergent interests that both faculty members and business managers started to pursue, in terms of not only an applied use and scope of new knowledge, but also the economic return on investment of conducting R&D activities. While researchers were progressively pushed to publish in scientific journals, as a way to contribute to their personal and institutional scientific performance, since the previously commented educational reforms of the 1980s; business managers were pursuing to maximise their economic profits. The main consequence of this was the loss of the earlier interactive process of mutual learning experienced by both figures (teacher and the industrial worker) at the individual level and the configuration of a new increasing network of relationships, accompanied by a continuous growth of the university community at the institutional level.

Concomitant with the increase in the number of both teachers and students, one of the most important changes regarding the university organisation was the creation of *Departments*, which in the case of Alcoy they were *Departmental Units*, depending on the principal departments located in *Valencia*. Departments internally structured and shaped the university in different knowledge domains, among which the *Department of Textile and Paper Engineering* can be again highlighted, because of its relevance to the main local industries surrounded the textile manufacturing. Yet, in *Alcoy* HEI the creation of the departments did not mean that they were composed of academics with a PhD; on the contrary, they were primarily formed by technical experts in the field (in Spanish, *Peritos Industriales*). From that period on, the academic staff at *Alcoy* had to undergo a process of training, curriculum development and promotion aligned with the

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academic practices found in larger universities. Indeed, until 1991, *Alcoy* did not offer doctorate coursework, or the full five year undergraduate degrees that would be normal in most Spanish universities. After 1991 the School of *Alcoy* added a PhD course in Textile and Paper Engineering. The eponymous department overseeing this degree was indeed that most connected to the industrial environment because of the wide range of services it provided to several textile and paper SMEs. There were still many lecturers (more than 50%) who were also technicians at local firms, or at the very least, individuals very closely tied to local businessmen (Interview 2, 2011), though their presence was decreasing and gradually led to the figure of the *Profesor Asociado*.

The *Profesor Asociado* within the new organisational structure of the Spanish university of the 1980s deserves some additional remarks. The *Profesor Asociado* was originally conceived as the figure responsible for keeping alive the linkages between the university and the firms located in the area, because only people with a certain experience in the business world could be contracted under that title. On the other hand, the rest of the university personnel were not adequately incentivised to work together with industry beyond their own preferences, or put differently, academics engaged with industry projects were only those who “personally made such a decision”, there not being clear incentives to do so otherwise (Interview 13, 2010).

From the *funding* perspective, the 1983 Universities Act made explicit reference to the independence of academic institutions and the devolution of funding and planning tasks to the Autonomous Regions. In parallel with the regionalisation of higher education policies, a new and important institution was added to the innovation systems: the technological institute. All the technological institutes were created as sectorial organisations and they inherited some of the roles of the earlier *Alcoy* Industrial School.

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Two institutes of technology were located in this area: one devoted to the plastics industry (AIJU, located in *Ibi*), and the other focused on the textile industry (AITEEX), located in *Alcoy* itself. As a result, the new figure of the institute of technology *broke* with the previous *institutional hegemony* of the industrial school in terms of knowledge exploration, creation, dissemination and application. Yet, this exchange of roles can only be understood under *the tailored-services-to-firms umbrella*. While the Industrial School continued to support local industry by training future technicians and offering several consultancy services to SMEs from the 1980s on, its personnel had to upgrade their academic CV (*internal dynamics of academics*) to accomplish the new requirements of the legal reforms of that time, if they wanted to keep or upgrade their status at the university, that is, to follow an academic career at the Spanish university system. Therefore its contribution to the local environment was not as direct as before, because of the time devoted to the research task, mainly the elaboration of their PhD projects. This was not the case for the figure of the *Profesor Asociado*, who still continued to work at the firm, as a *conditio sine qua non*. On the other hand, technological institutes were directly involved in several projects devoted to upgrading the firms' technological capacities (this indeed had been its explicit mission since its creation in the mid-1980s). Moreover, the composition of these new organisations was similar to the earlier industrial school. Their partners were the same industrialists, as well as different managers associations grouped around a specific sector: for instance, AITEEX – the textile technological institute-- was formed by several textile firms and their sectorial managers association (ATEVAL). One interviewee, who was working for AITEEX during a short period of time (around 6 months) ensured that at least more than a 10% of the university staff, had already worked for some technology institute, before becoming a part of the university staff. Local firms started to work together with the

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technological institute, while the *Alcoy's* HEI concentrated its efforts on building new kinds of relationships with the academic world. Some years later, around 1995, the *Alcoy's* HEI began to reinitiate formal relationships with the local industry. Meanwhile, the technological institute had already been cementing its position for nearly an entire decade as the main partner of the textile firms in the area. In this way, AITEX gained a comparative advantage from the standpoint of confidence in its proposals for new research projects, development and innovation in tandem with its industrial partners. Despite the increasing separation between the roles of both institutions --the *Alcoy's* HEI and the technology institute-- there were still some collaboration actions between them. For example, in providing expertise: university personnel were teaching some specific courses which were offered by the institute of technology, during the late 1980s and throughout the 1990s. This was partly due to the fact of some engineers were moving from one institution to another throughout this period (Interview 2, 2011). Yet, this connection between Alcoy HEI and the Technology Institutes was gradually weakening over time. Moreover, the cognitive distance between the education level of firms (and thus their new technological partner, AITEX) and the university was enlarged (Interview 9, 2011 and Interview 8, 2013), while this phenomenon did not occur in the relationship between the institute of technology and local firms¹⁸. The interviewees argued that over the decades of 1980s and 1990s while the staff of the Industrial School of Alcoy was upgrading their educational level by obtaining the PhD degrees, at the local firms and at the technology institute, the presence of doctoral holders was very scarce or insignificant (Interview 8, 2013). Here it is noteworthy to mention that the research conducted by PhD holders at the Industrial School was not

¹⁸ In the latter, there was no employee possessing a PhD until the beginning of the 21st century.

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absolutely focused on the needs of local firms, but rather aligned with the research lines that each department was offering (Interview 4, 2011).

The period from 1970 to 1995 is vital to understanding the current situation of the local innovation system in *Alcoy*, for several reasons. First, within this period a process of democratisation was witnessed not only at the university level with their first democratic elections, but also at the societal level (the dictatorial regime ended in Spain). Moreover, this process of democratisation led to massive access to education at all levels and thus, an increasing number of students and teachers were engaged in university life. Second, new actors appeared, such as the institutes of technology, which in the case of *Alcoy* were supporting industry more directly, while the university was involved in a project of promotion and academic curriculum development with regard to its personnel (who were increasingly involved in doing research). Third and quite linked to the previous observation, *Alcoy's* HEI was preparing a process of professionalization of its relationships with its environment: after seeing its separation from the industrial environment a new position was fashioned to concentrate these contacts. Although during the first years, in the case of *Alcoy*, this role was assumed by only one person, a team of professionals was gradually formed to carry out its responsibilities. Fourth, the identification of local demand for knowledge was principally assumed by the technological institute for two reasons. First, the university personnel started to be engaged in several research projects with little direct connection to the local demands of firms, beyond the aforementioned figure of the *Profesor Asociado* (or some teachers with similar interests). This disconnection is due to the alignment of the research projects with the already research lines agreed at the Department level. Second, the technological institute generated a continuous source of tailored-services demand for

consultancy and other kinds of technological projects, just as had occurred earlier with the nascent Industrial School. Moreover, all the actions carried out by the technological institute were supported by public industrial policies, similarly than the research projects conducted by the Departmental Units of the Alcoy HEI. This fact is showing how the different actors within the local innovation system in Alcoy were public policies-driven and missing the important connection with local industry, which additionally was investing in sectors with short term benefits, like the building sector. It is not until the 1990s that the local economic engines started to diversify to modern sectors like ICT or design-based businesses, which provoked a set of different targets for the HEIs in terms of their contribution. Specially, from 1990s on, Alcoy HEI started a new era characterised by a clearer visibility at its local context.

4.4. The Configuration of Today's Campus: Alcoy's Local Roles within its Local System of Innovation

The second half of the 1990s decade is considered a vital milestone within the history of the Alcoy's HEI, among other reasons because, for the first time, five-year degrees were introduced into the university programme: Industrial Organisation Engineering and the *Licenciatura* in Business Administration. To access the former, students had to finish their studies in technical engineering (three years), and then be enrolled in Industrial Organisation (two years). Moreover, the school started to monitor its relationship with industry and developed sets of indicators for the first time to measure these ties. This is the main reason we found it impossible to compile a complete series of indicators for

this study, such as number of contracts¹⁹ with industry. One of the most far-reaching shifts at all levels was the introduction of information and communication technologies (ICTs) into the university's everyday life. ICTs allowed it to redefine numerous subjects and even to create new educational offerings, such as telecommunications and computer engineering. While the former was introduced in 1992 in Alcoy University, the latter was incorporated in 1996. The introduction of these new degrees supposes the appearance of a new HEI model, along with the rest of Spanish universities. UPV Campus of Alcoy incorporates the management system model from its Valencia's headquarters and some of the degrees already offered in Valencia (mainly ICTs-related degrees). However, as one interviewee highlighted, the introduction of ICTs degrees was mainly due to not only their relative low expense of introduction in comparison to other degrees with more expensive requirements, but also because of their expected results in terms of employability:

Why? Because to teach Computer Sciences, for instance, is very easy. Almost no investment is required. We have computer rooms, we have computers... We have teachers with background in Electronics, we have Telecommunications teachers, we have Basic Computing teachers in all courses and in all degree... Only by hiring four more teachers, we could offer a complete degree [in Informatics]. How much? I am thinking in very few money... And now, if you think about asking for a degree such Aeronautics... unbelievable, of course!²⁰ (Interview 7, 2009)

As a consequence, the Alcoy HEI's evolve to a new stage by incorporating new degrees (with high expectations of employability) or by adapting the existing ones to the new

¹⁹ Moreover, the existence of confidential conditions in the contracts has not allowed our analysis to be segregated into different knowledge domains in order to see their evolution throughout the period of study.

²⁰ My translation

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legal and societal requirements. For instance, as there is a lack of local skills with expertise in these new fields, the university start to hire new university staff wherever they are found. So, a new generation of lecturers is coming not only from the traditional local industry (Textile and Mechanics) but from academic trained outside the locality. In one teacher's words "there is a tremendous reconversion process at that stage" (Interview 7, 2009).

In 1995, a new figure was created to enhance and improve university contacts with industry: the *Area of Relationships with the Environment*²¹. Its rationale came from a finding that the *Alcoy University* had traditionally been "closed to the whole society, since it was serving only a few families", a statement found in almost every interview conducted with both groups: UPV academics and managers. However, the *Area of Relationships with the Environment* in Alcoy differed from an already established *interface structure* on the main campus of *Universidad Politécnica de Valencia*. The principal difference was that it gathered all the services that in Valencia were spread in different areas in only one person at the beginning. Obviously, as this area experienced an increase in the number of services to society and industry contacts, it was necessary to hire additional staff that would meet this growth in demand for such services. Until that time, all these services were possible only thanks to some teachers' altruism and will, and the contracts were managed personally by them, as it had always occurred. But, from 1995, all the "extra-academic" services (mainly life-long learning, practicum and technology transfer) were provided by management professionals.

²¹ In Spanish, Área de Relaciones con el Entorno.

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The functioning model was adapted from different *intermediaries* or, as Fernández de Lucio et al. (1996) state, *interface structures*, already established on the main campus of the *Universidad Politécnica de Valencia*. Within this new structure, a set of services were gradually established and offered to society in order to facilitate or regulate these university-society linkages. First, from the student viewpoint, it was possible to put several job positions (offer side) in contact with students (demand side), which until then had been managed in an informal and voluntary way by teachers or by industrialists. After a period of experimentation, these job placement services were improved and are better managed today, with both sides benefiting: the manager can gain expertise from a high-skilled worker, and the student can initiate a legal and compensated relationship within a firm, or with other kinds of organisations (technology institutes, managers associations, foundations, among others). This is the so-called *Practicum*, which had been working for years in other contexts, even in the current case of *Alcoy*, but in an informal way. Yet, the possibility of undertaking the final dissertation (required before a diploma is granted), through placement in these organizations has been one of the most successful ways to start collaborative projects between the university and its environment. Indeed, we have found this linking mechanism to be one of the most successful university-society collaborations since its formalisation in 1995 as we will see subsequently. The overall explicit mission of the *Universidad Politécnica de Valencia* (and also *Alcoy* University's mission) since 2007 has been:

to provide its students with an integral education through the creation, development, transfer and critical reflection on science, art and culture, whilst being respectful with ethical principles; an education decidedly leading towards aiding our students in finding an appropriate job in accordance with their studies (UPV, 2011a).

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Once we have seen that the university aims to help its students to find “an appropriate job” (UPV, 2011a), the problem lies in *how* to achieve this objective. One way is to develop a project where students are able to implement their theoretical knowledge learnt throughout their university studies. This activity was considered by all interviewees as a win-win strategy, since students can apply part of the skills acquired at the university, while the host organisation can explore new areas by implementing new approaches coming from the university’s expertise (e.g. an engineer candidate), via the intercession of a university teacher as supervisor. Yet, the culmination of the project is not necessarily the end of such relationship between the university, student and host organisation, as many examples can attest --included my own experience-- but rather the starting point. On the one hand, the student could find a job in the same host organisation that helped them to implement their idea for the dissertation. From the host organisation’s perspective, in turn, new areas could be explored and exploited thanks to the chance taken by the university student and their supervisor. And last, from the standpoint of the university professor, participation in the project has been seen as the starting point to carry out new projects together with the firm, as a relationship has been established with the former partners. Moreover, the professor might encounter certain shortcomings in the organisation that could be addressed through new research projects (or through other kinds of collaboration, such as tailored consultancy services). In fact, we find illustrative the case of a particular university teacher (from the Department of Business Organisation) who has gained a great deal of contextual knowledge from the firms located in the area of *Alcoy*, mainly linked to the textile industry, by utilising this particular kind of relationship between his students and the different heads of several organisations (not only firms but also managers associations). After observing how a university faculty member can comprehensively assess the environment, multiple forms

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of interaction emerge. In addition, the contribution of the university becomes more visible, as its members are directly interacting with their surrounding environment and, in the best case, improving the absorptive capacity of the productive environment²². Unfortunately, the explicit incentives of the *UPV* have not been focused on establishing linkages with the local environment, and only a minority with a proactive attitude have been part of this group. Among them, we can highlight most of the *Profesores Asociados* and other professors with previous connections with local firms.

The possibilities for collaborations similar to those mentioned above have increased, but interviewees have stressed the problems generated by the disconnection between the university's offerings (with an increasing high-quality scientific knowledge acquired by the university staff) and the actual needs of firms located in the area, which still lack of absorptive capacity to applied such scientific knowledge that university staff may provide (Interview 1, 2010). This issue is germane to one of the topics within the innovation systems approach: the disarticulation of the system provoked by the different actor dynamics in the search for and implementation of innovation projects. The university has tried to tackle this problem by organising several seminars to (1) serve as *an open space to debate* and (2) communicate the existing and new educational and research offerings. Regardless, the university has also extended its scope and has sought out partners in research endeavours or other kind of collaborative projects beyond its traditional typical sphere: *Alcoy* and its influence area, the so-called VCDs.

²² Additional information is not available, since I have found certain constraints when closely examining these issues. Constraints are shaped by ethical and confidential issues.

Additionally, we found another disarticulation in the local system: between *AITEX* (a technological institute) and the Campus of *Alcoy* (the university). Both institutions have started to compete in attracting students who are interested on Textile Engineering Studies. Further, in 2010 *AITEX* signed an agreement with a private Valencian university (*Universidad Católica San Pablo*) to offer a new Master of Technological Innovation and Technical Textiles. This news was poorly received by the faculty of the *Alcoy's* HEI, since they felt the regional governmental bodies were duplicating efforts and resources to provide quality technical education in the field of textiles. Furthermore, some faculty members had to start an intense search for new students in other geographical areas, for instance, in Latin America, given the increasing direct competence for new students between these two institutions (the technology institute and the university), in addition to the requirement by the Bologna Agreements to achieve a minimum number of students per degree. Two important issues need to be stressed. First, the place of both institutions within the local innovation systems reminds us that although new actors, such as institutes of technology, increase the number of players within the local system of innovation, as was pointed out in the literature review (see section 2.1.2: The End of the University Monopoly on Supplying Knowledge) their expertise is still depending on the university knowledge base. This dependence is not only found in terms of human capital, since a small group of people coming from the local university is working at the institutes of technology. We also encountered a dependence relationship between technology institutes and the local university, since the latter really creates new knowledge which can be later applied by technology institutes through collaborative projects with firms, in line with the conclusions obtained by Godin & Gringras (2000). However, in terms of incentives and duties we find that while institutes of technology staff aim to work with firms through research

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and consultancy contracts in a very explicit manner, university personnel have different aims that sometimes seems to be contradictory, because of two main reasons: first, the university personnel have an increasing teaching load and they start to conduct research projects, which are very time-consuming activities, above all, during the first stages. Their institutional incentives are framed by accomplishing such objectives. However, while teaching and research activities were compulsory for the university teachers, formal relationships with firms were only a voluntary activity. Moreover, on the one hand university personnel spend a large amount of hours for the preparation of teaching and research duties and they have clear incentives to pursue such objectives, though we found cases where teachers do not think that those incentives are enough motivation. On the other hand, there is a lack of clear economic and institutional rewards to work together with firms, compared with other sources of funding. In this sense, they have to be able to undertake their objectives according to what they are expected to do from the university and from the public administration. The following quote extracted from the interview conducted with a Telecommunications teacher might clarify this point here:

But the real problem is that “sexenios” are optional, because a reward of 90€ per month for six years of research, with five international publications. That is a hard job, isn't it? That is very time-consuming and costs a lot. Even it is easy for anyone to give any course in Power Point and economically it has already covered what one sexenio can provide you in several years. Of course, there is no motivation [to work together with firms], I mean, it is economically foolishness. And academically a “sexenio” represents to reduce one credit of your teaching duties, what is [in his view] no motivation for people (Interview 1, 2010).

The period from 1995 on is key to understand the current role of Alcoy HEI since several actions to re-establish linkages with industry took place, as for instance, the creation of the *Area of Relationships with the Environment* – an interface structure

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between the university and its environment (Fernández de Lucio *et al.* 1996). This area is integrated within the *Campus of Alcoy*²³. It is composed of five main divisions within this structure: the Division of Employment (and Practicum) services, the Life-long Learning Centre, the Technology Transfer Office (*CTT*), the Institute for the Creation and Development of Enterprises (*IDEAS*), and the Institute of Education Sciences²⁴.

These different centres are located in the same place, a big office, and are tightly connected to the main offices in *Valencia* (at the *Universidad Politécnica de Valencia*). Among these five departments, three of them (the first three) are able to generate income for the university, so they help diversify funding sources. The last report published by the *Area of Relationships with the Environment* showed an increasing number of contacts between the university personnel and other surrounding institutions. In that sense, we can highlight that the Campus of *Alcoy* has garnered better results compared with the two other *UPV* Campuses (*Valencia* and *Gandía*). In the remainder of this section we will present a summary of the activity of the Campus of *Alcoy* at different levels²⁵ since a set of new contributions --translated into new services-- has been established at the university level in order to serve mostly the industrial environment.

²³ Unlike other models where one finds this kind of entity outside the university, i.e. [Eco Plus](#): The Business Agency of Lower Austria, (Personal Communication with Richard Plitzka in a Summer School on Higher Education Management and Regional Development, 2nd July 2008).

²⁴ We did not develop the role of this institute, since it has almost no connections with the environment, thereby being a provider of internal psycho-educational services for teachers and students.

²⁵ In the former sections, we did not present all of them due to the scarcity of available data for the period of analysis.

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The division of employment services has been in operation since 1995. Yet, since 2006 it has been working under agreement with the *Valencian Employment Office*, to manage not only job positions for university graduates (and students), but also any job vacancies for any unemployed person. Additionally this office offers specific courses to improve candidates' possibilities of finding a job and their economic results have been positive since 2006. Before 2006, we have to highlight the important role of this office in establishing linkages between students doing their final thesis and the employers (Interview 6, 2009), though the responsible of this area acknowledges that the word-of-mouth marketing was key to spread this service around both students and employers.

The *Life-Long Learning* centre (hereafter, *CFP*) was established in 1997. Its evolution also shows a positive and increasing trend not only quantitatively, with a growth rate in terms of economic profit of 148% between 2002 and 2008, but also qualitatively, due to the good reception that the on-line courses offerings have experienced (Interview 6, 2009). However, as we could extract from the interviews, this centre had to regulate the incorporation of new courses, since its manager realised that some teachers were offering simultaneously the same (or very similar) courses they were already teaching within their official studies programme (Interview 1, 2010). This centre has also been a bridging point to connect several technology-based companies interested in putting into practice their software or their management tools for their future or potential users. This way, the university has served as a *testing-institution* where students have learnt the most updated techniques and software in an affordable way, its teachers being not only academics, but also professionals from the private sector (Interview 6, 2009).

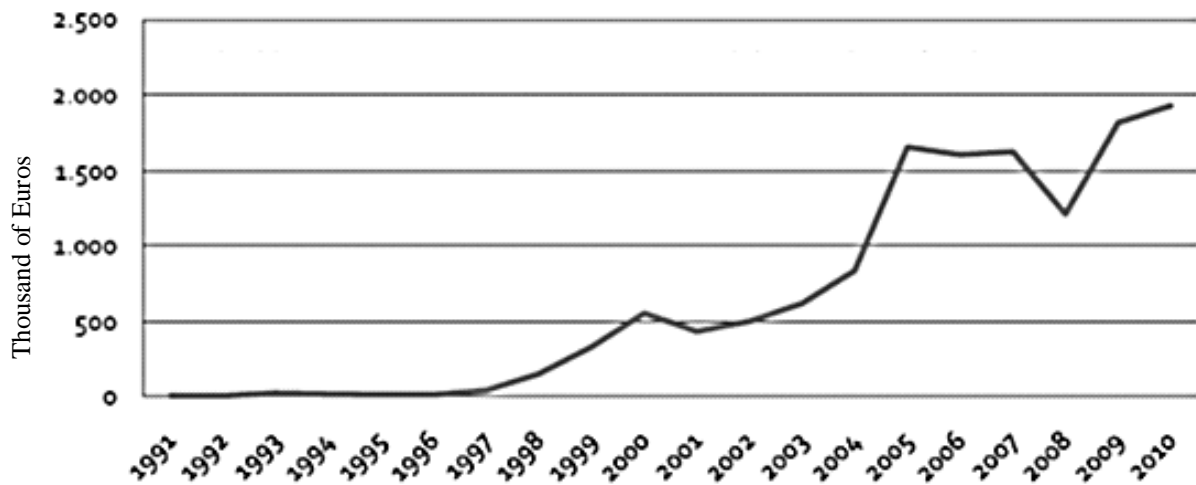
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The technology transfer office of the Campus of *Alcoy* (hereafter, *CTT*²⁶), established in 1995, has pursued the mission of facilitating the research activity of *UPV* personnel and to managing the transfer of the knowledge created or generated by them (Interview 13, 2010). In order to accomplish such a mission, *CTT* has carried out a set of services addressed not only to their internal users (academics), but also to their external users (mainly private SMEs and public bodies). The first task undertaken by its manager, for example, was to collect the research offerings of *Alcoy-UPV*'s members into a catalogue, called *CARTA*²⁷, as all the *UPV* faculties did (Interview 13, 2010). Once he collected all the research areas and possibilities to interact with others, he started to act as a *messenger* by informing others about the different policies and *calls* from different public and private bodies. And thus a process of professionalisation started with regard to university-society linkages, which has presented a positive trend in terms of number of contracts at all levels, although the limitations previously pointed out, in terms of rewarding (Interviews 10 and 13, 2010).

²⁶ In Spanish, Centro de Transferencia de Tecnología

²⁷ <http://www.upv.es/carta> [accessed in Oct 2008]

Figure 3: Evolution of R&D and Innovation activities, in terms of external funding through competitive sources.



Source: UPV (2011b: 84)

Moreover, it is remarkable that, although the *CTT*'s action focus has been mainly regional, or even local at the beginning, several reasons have to do with the search for non-regional partners in the *Alcoy*-UPV Campus' activity. First, the bad financial situation of regional public bodies reduced the chances of accessing those funds. Second, the very trajectory of particular knowledge domains required the collaboration with firms and other organisations that were inexistent within the territory, and therefore they had to be contacted despite their distant location. And third, there was no explicit incentive to collaborate locally, so both academics and managers exploited all the opportunities they found at the national and international scale. For instance, we remember the aforementioned case about the cognitive distance among the university and the technology institutes and local firms.

Within the *Area of Relationships with the Environment*, we can also find the IDEAS Institute. The *Alcoy* team consists of one person, though she can be supported by

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counterparts from Valencia since its creation in 2000. This manager has been offering professional support to entrepreneurs from the maturation of their idea to the implementation of their firm. The IDEAS institute aims to promote and develop the entrepreneurial culture within the UPV members. In *Alcoy*, the number of total firms created has been 18, from 1999 to 2008, while the institute has given advice to more than 500 people within the same period. In that sense, we can conclude that although IDEAS has opened new ways to contribute to its surrounding environment, its influence has been minimal, in quantitative terms (Interview 14, 2010), since there has had no spin-off created from research results generated at the local university. Moreover, we have to take into account the existence of three agencies with very similar services within the local system: the *ADL* (Local Development Agency, which depends on the local government), the Local Chamber of Commerce and *CEEI* (*Centro Europeo de Empresas Innovadoras*), the latter being the most fruitful in terms of firm creation and from the users' perception²⁸.

Within the last analysed period (1995 to 2010), we can observe how the local government and the university did not jointly collaborate in any formal project, as far as I know, until the creation of a *Cátedra*, named *Alcoy, Cuidad del Conocimiento*. The objective was to elaborate a Strategic Plan for the city of *Alcoy*. But, the problem found within such a project was the scarcity of endowments and the unwillingness of the local governing party to implement the different lines of action proposed. Although there were a great deal of potential projects to undertake, and for the first time all the local actors were involved in the elaboration of such a strategic plan, the project was finally

²⁸ I have personally utilised this service with some friends. We created two firms with the useful support of CEEI's personnel.

rejected and no more funding and efforts were put into it. Despite this pessimistic conclusion, (in 2010 the local government changed its political composition), there is still a chance to reconsider new collaborative projects between these two spheres.

Finally, one new way that the university has opened itself to interact with society has been based on the creation of *clusters*. Though beyond their academic definition, developed in the literature review chapter, these organisations are composed of several public and private bodies, which pursue common objectives. I have remarked *beyond the academic definition* because *Alcoy* clusters are understood locally as *the new business organisations*, which additionally have the support and the active presence of the university. In fact, the most common promoter of new projects has been some university personnel linked to the Business Administration and Management Department. There are two examples of creation of local clusters (Aero Cluster and Design Cluster) which are based upon two emerging sectors that have little connection with traditional industries. Even so, they are trying to collaborate with them through interdisciplinary projects, such as textile products development for the aeronautics industry and the elaboration of a catalogue with all the local designers and the services they offer. The impetus that the university has offered in this sense has been reinforced by new legislative changes which incentivise university personnel to interact with society, (only since December of 2010), though with poorly endowments, as was remarked. Stronger ties (than those already observed) between university and its surrounding environment are expected, although their real effects on local economy are still to be a reality.

4.5. Perceptions on the Future of the University

The final part of every interview during the research process was devoted to leave room the interviewees to express their perceptions in an open manner about the future of the university at two levels: on the one hand, at the institutional level, and on the other hand, at the local context level. Here, we could appreciate two types of discourse: one institutional discourse, more normative, provided by the managerial bodies of the university (directors, university managers and administrative staff) and another discourse provided by academics' perceptions, obviously more subjective.

An example of these different voices can come from the reality perceived about the current university role. This role is shaped by several reforms, not only at national level as a consequence of the political shift (towards the right side) in the national government, but also supranational, exemplified by the well-known Bologna Process. From the national level viewpoint, while academics highlighted the cuts in the education and research budgets --both regionally and nationally-- which consequently derived in an increasing pressure in terms of their teaching and research duties but with a minor endowment in this sense, staff coming from managerial bodies did not express any critical comment on such changes that affected to the university staff, and shared the same rhetoric that expresses the benefits of the university reforms. Apart from this, at the supranational level, academics also felt changes were proposed --and have already started to be implemented-- without any process of fluid communication with the affected sector, that is, themselves, the teaching staff. That feeling was expressed as problematic, since teaching staff was asked to change their studies plan and the way they conduct their courses, but without any economic and technical support to do so. In that sense, the process is far from solve some of the problems that actually universities

and their members are facing, since actions are delinked from reality. On the contrary, the managerial bodies did not express any critical comment on such changes that affected to the university staff, and shared the same rhetoric that expresses the benefits of the university reforms, in terms of European recognition of degrees, flexibility on studies plan, more practised-oriented lessons at classrooms, etc. The following fragment extracted from an interview with an academic can corroborate such a tension between the institutional discourse and the academic perception, exemplified with the Bologna Process implementation at Alcoy University:

I'm not really informed about the Bologna process but as far as I know it seems foolishness to me. That is, the single thing that this process has been made in the last four or five years has been to collapse all universities. Everyone is astounded by waiting to see where and how it takes shape. And hence you remain expectant seeing how these precious years have been lost. After all, the way of teaching that it is promulgated [by the Bologna process], being honest, I do not believe in it, why? Because on one side so that there is enacted to have very small groups to make it an extremely personalised teaching and being close to the students and so on, which seems great to me, because as I have said when I studied here [at Alcoy Industrial School] we were few people in class and it was wonderful. But what is the problem? The problem is that while on the one hand, reduced groups at class are encouraged, and on the other hand, there is a limitation, in terms of efficiency, each degree must have 50 or 75 students. Then you see that neither politicians nor senior officials who are promoting that, are able to understand what they enacted, what good are these changes? Or it may, how am I going to personally supervise a class of 50 guys? There are not enough hours in the day! Do you know? Then it makes no sense, they are doing it very wrong. The original idea then it might be fine, but you have loaded. I've been there visiting universities in Finland and there so there were classes of five students and no one was scared, and here they are closing degrees with more than one hundred and fifty years of tradition [referring to Textile Engineering studies] [...] This is all a fallacy and a story that are already assembled and some politicians (Interview 1, 2010).

That kind of opinions is common in the vast majority of public universities in Spain, where teachers are being pushed to teach more and more (with less decreasing resources), which in turn reduce the time they can devote to research or to engaging in projects in collaboration with other actors of the local system of innovation. The

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only hope academics interviewed have is related to their professional ethics and commitment to their profession, beyond the institutional and legislative changes at all levels. Moreover, some interviewees recognized that, at the end, the mechanisms to engage with firms are definitely personal-like. And additionally, from the vast amount of contacts that academics can do in one year, for instance, only fructifies a few, which coincide with the limit they have taking into account their official duties (teaching and research). That way, the so-called third mission of universities, in terms of university-society linkages, is no way mandatory and relies on the will of each faculty member, who will usually prefer to work with firms or organisations that share a similar culture than them. Here, it is remarkable to highlight the perception of the local culture manifested by academics, since most of them (from those who were interviewed) believed that only very few firms were able to work in collaboration with them, given their respective needs and intellectual aspirations. Moreover, we are talking about an evolutionary process of mutual learning, as can be extracted from the following testimony of an academic:

The relationship between firms' managers and academics must be reciprocal. In my case, I acknowledge there firms with which I would never work with. Why? Because, they do not know even what they want. Sometimes they are only thinking about their own problems and there no collaborative spirit. And sometimes, they do not even think about to pay you for your services, and things like that. At the end it is a matter of evolution. You can be immersed on the supervision of some specific projects that you undertake in the firm X. Things are going well and from that point on you start a relationship, and moreover, you are recommended and later you are called to visit another firm: "Ei, come to visit that firm..! (Interview 6, 2009).

Such an evolutionary process can also derive in the creation of a firm where the academic is taking part and making decisions. The problem found is that two of the

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interviewees declared that the process of firm creation has to escape to the university bureaucracy, because otherwise you would find several obstacles that you would not find by contacting, for instance, with a friend who would own that firm from that moment on. The obstacles interviewees remarked had to do with the complex decision making schemes and the limitation to undertake certain projects that university spin-offs have to establish. In any case, this kind of mechanisms of knowledge transfer by firm creation was almost inexistent, apart from two examples found through the interview process by two academics. Consequently, the influence of the university on the local industry by this channel seems to be very weak. In contrast, one academic highlighted another type of local engine: the “residential engine”, referring to the effect that foreign students have in the local economy by renting houses, by buying clothes, and by living in the city.

CHAPTER 5. CONCLUSIONS

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5.1. The Local Roles of Higher Education in a Peripheral Region

This thesis aims to show how a specific HEI has played an essential role in a low-tech context, and under which conditions it has operated. With over a century of acquired experiences, it can be concluded that its local role has adopted diverse forms in accordance with internal and external circumstances, thereby establishing clearly three principal stages which is an original contribution of this thesis. The first period, stretching from its inception (19th century) to its affiliation with the UPV, was characterised by a centralised form of interaction with certain groups of society, given the case that a solid bourgeoisie coincided mostly with the two other spheres: the local government and the industry. In this way, and since the focus of local systems of innovation, we find a highly articulated system of actors and fluidity of the divisions between them. This linkage has a set of individuals determined to play different roles in different institutions in a very coordinated, though not democratic, because until 1978 would not end with the dictatorship of Franco. On the contrary, we also observed a wide swath of society that most times was not part of the decision-making process, i.e. blue-collar workers, and a great proportion of local population beyond the bourgeoisie class and the highly-skilled technicians. Thus, political and legal factors, many of them external, shaped this local group of actors and pulled them in different directions, thus weakening the links between the school and its local environment. *Alcoy's* industrial school had been historically characterised by fluid interactions between academia and industry, but from the 1980s a process of professionalization of its academic personnel brought an increasing separation between academic activity and local industrial needs.

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Other organisations, like the institutes of technology, came to cover this gap. However, we cannot forget that most of the professionals who work at the institutes of technology come from the university and moreover, their knowledge is based on the university expertise, what reminds the central position of university among the rest of actors within the innovation system, as Godin & Gringras (2000) had already pointed out. In addition to that, the academic personnel have not been adequately incentivised to undertake collaborative projects with industry, as was remarked in several interviews (Interview 1, 2010; Interview 9, 2011; Interview 8, 2013).

Accordingly, the HEI has remained apparently passive in fulfilling the local needs of industry during the 1980s and 1990s. Despite this, we cannot rigidly affirm the Industrial School was totally isolated with respect to its local context, since part of its personnel continued to work together with industry – *Profesores Asociados*-- on their own, or in an informal manner. Apart from this, we can also conclude that this process of becoming a part of a bigger university brought better conditions to face several challenges such as the ICTs revolution, the diversification of the local existing industry or the introduction of research findings into traditional industries, as may represent the textile industry. The picture of a palm tree could better represent the strategy that the Campus of *Alcoy* has tried to follow from that stage: having solid roots in the local milieu and several branches in different places according to the contacts their personnel were built and consolidated, as an evolutionary process, and that is why the local innovation systems approach has provided useful insights to understand the current debate on the role of universities, at least, in the case study presented in this thesis. However, as we have seen, daily practice of members of the university has been directed not only for its obligations at the level of curriculum, but also at the level of

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remuneration, research career, etc., which forced them to act on the sometimes contrary direction from the main strategy of having solid roots in the local milieu.

This way, we have observed increased participation of the university personnel at different scales apart from the local one: for example, European Projects or R&D National Plans. In this sense, the role of contributing actively in local development has been more in training highly-skilled and talented people, than in transferring technology directly to firms, due to the low number of university patents and the inexistent creation of spin-offs. However, two university teachers have supported their students when they have decided to create a firm, jointly with an external non-faculty member, though such an entrepreneurial spirit has not been extended to the university landscape, and hence this role cannot be understood as the most remarkable. As a consequence, we can deduce that such entrepreneurial spirit at academic level actually exists, and what has to be adapted is the regulatory framework at institutional level to be adapted to specific needs or cases.

Currently, the establishment of two completely new clusters (on Design and on Aeronautics) have started a new collaboration mechanism in order to integrate scientific and technological expertise within a set of local firms and professionals, through the accumulation of a critical mass to face large projects, or to open new markets. This has not fully contributed to the diversification of the existing industry, and thus creating new forms of action for the local industry, given the lack of continuity not only of public subsidies to carry out this kind of ambitious projects, but also because of the lack of understanding among actors that were forced to create such associations by short-term incentives (mainly public subsidies with no evaluation after the projects ended up) and they did not fully understand each other's needs. For example, university managers

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and researchers were who initiated most of collaborative projects because they found a possible line of public funding. However, most of non-university players did not appreciate the benefits of such a potential collaboration, being passive actors with no motivation to include such technological and scientific knowledge or at least with few incentives to do research without get additionally short-term economic benefits.

Finally, and from a practical viewpoint, this dissertation has attempted to highlight the importance of carrying out historical and context-based analysis when it comes to sketching out the new role of universities in their respective local systems of innovation. Such an ambitious task has required to mapping out their capacities and their priorities and hence, not copying or directly importing strategies from elsewhere. It is also important to highlight the enormous complexity in identifying the indicators suited to monitoring their evolution and, at the same time, being able to perform well in certain rankings or scoreboards. For that reason, we found it more interesting to ask about the university personnel's perception about the evolution of their activities over a long period of time, than to select a set of indicators isolated from their interpretation. In the process of identifying actors, relationships, practices and behaviours, an evolutionary approach was adopted through the local innovation systems logic. For instance, within the third stage, when Campus of Alcoy took part of the UPV, this approach was extremely useful to see at the forces in order to mapping out the changing local institutions and their main incentives to interact locally or to look for new partners beyond the local sphere. Therefore this process of tracing the different socioeconomic and demographic state in a local context supports the thesis of that evolutionary economics explains to a great extent the processes of change at the organisations.

5.2. Limitations of the Study

Like all research, this dissertation has limitations. We want to highlight at least three main limitations that might be addressed by conducting new research projects. The first limitation is associated with the methodology. Because this is an interview-based qualitative study of a specific HEI, it cannot provide conclusive and highly-generalizable categories. Further research in other HEIs within this kind of context, and most importantly in other local settings, would be required to achieve a higher level of abstraction and generalizability. A primary avenue for future research is to enhance the external validity of the outcomes emerging from this research by considering other contexts and local innovation systems. Second, within the case the inquiry focused on the historical aspects of the role played by a specific HEI, but additional historical research on this setting would be necessary to explore how the main innovation processes themselves have evolved. The third limitation is the findings only refer to those interactions noticed by the researcher and that does not mean all interactions (between university personnel and society) are included. Nevertheless, since a comprehensive study has been conducted, it can serve as a starting point to include those remaining interactions.

In addition to the research necessary to address the limitations of this study, this dissertation suggests a set of avenues for future research. First, it seems relevant to carry out more case studies of not succeeding university–industry interactions. As a matter of iterative learning, those cases would serve to point out the weaknesses of different models of how to connect the university expertise with its immediate surroundings. Most of the research done on the subject, and the examples usually cited by policymakers, are cases of successful, working university-industry relationships, and

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based on high-tech contexts. By the contrary, most of European regions lacks of the kind of features that characterise high-tech locations, so policies should be articulated by taking into account the diversity of locations, instead of trying to copy the best. Second, students have not been included within the process of interviewing, though they have been active part of, for instance, the Bologna process. A specific case study about their adaptation to this new situation can be a focus of future research, as possible different views of this controversial process may emerge and thus complement the hegemonic voice about this issue. Third, our case study is based on certain traditional industries whose current sources of new knowledge and technology transcend geographical boundaries delimited by the study itself. It is thus necessary to perform additional research about the interplay of the local/national/global triad and how it plays out in the innovation process of different industrial sectors that the local setting holds. Hence, a promising research avenue in this respect would be to examine how the innovations proposed by local actors affects the geographic scope of a firm's interactions during the innovation process. Fourth and finally, beyond the university's role, additional research is necessary to address the question of how agglomeration economies are taking place in a world where these kinds of economies seem to have lost their so far relevance.

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APPENDIXES

**Appendix 1: Invitation letter model addressed to university
personnel**



MINISTERIO
DE CIENCIA
E INNOVACIÓN



INSTITUTO DE GESTIÓN DE LA INNOVACIÓN Y DEL CONOCIMIENTO,
INGENIO (CSIC-UPV)

Estimado/a XXXXXX:

En primer lugar, me gustaría darle las gracias por cederme este espacio de tiempo hoy. Mi nombre es Francisco Javier Ortega Colomer y estoy realizando la tesis doctoral en INGENIO (centro mixto de investigación entre el CSIC y la UPV). En concreto, soy uno de los investigadores que forman parte del Proyecto del Plan Nacional cuyo título es “La Tercera Misión de las Universidades: Nuevos Enfoques Analíticos”, en el que estamos explorando la manera en que las Instituciones de Educación Superior están vinculadas con su entorno siguiendo dos cuestiones principales: 1) ¿Cómo ha evolucionado el papel local de las Instituciones de Educación Superior en un contexto predominantemente de industria tradicional, incluyendo cambios en sus interacciones con la sociedad en la que se inserta? y 2) ¿Cómo el personal de esa Institución de Educación Superior ha identificado las necesidades locales de conocimiento durante los últimos veinte años?.

La entrevista durará una hora y media aproximadamente. Yo mismo grabaré la sesión con el fin de no perder ningún detalle de cualquiera de sus comentarios. Además estaré tomando algunas notas durante la sesión.

Todas las respuestas serán consideradas confidenciales. Esto significa que sólo serán compartidas por el equipo de investigación (mis tutores y yo). Asimismo aseguramos totalmente que cualquier información que incluyamos en el trabajo no le identifique como la persona que responde. Si usted lo desea le ofreceré la transcripción de la entrevista para asegurar que he reflejado de manera correcta sus opiniones.

Muchas gracias por su colaboración

Fdo.

Francisco Javier Ortega Colomer

Appendix 2: Interview model addressed to university personnel

Presentación y agradecimientos
Datos Personales En primer lugar, ¿donde naciste? ¿Estudiaste en Alcoy? ¿Qué titulación? ¿Por qué? ¿Desde cuándo llevas trabajando en la Escuela? ¿Cuáles son los cargos oficiales que has ido desempeñando desde tu incorporación a la plantilla de la EPSA? ¿Fechas clave?
Contexto
¿Cómo describirías la evolución de la actuación de la EPSA en su territorio? ¿Qué contribución destacarías y por qué? ¿Cuál ha sido la tendencia general en los últimos veinte años? ¿Podrías dividir en diferentes hitos los principales cambios? ¿Cuál es la percepción que tiene la EPSA del entorno empresarial y viceversa? ¿Cuáles han sido los factores determinantes de esa trayectoria?
En tu etapa como estudiante...
¿Años? ¿Personajes clave? ¿Cómo estaba organizada la vida académica en la institución? ¿Algún cambio a destacar? ¿Investigación? ¿Relaciones con la industria local?
En tu etapa como académico-investigador...
¿A qué departamento has pertenecido desde tu incorporación en la plantilla de la EPSA? ¿Cómo te planificabas tu día a día? ¿Cómo se organizaba el departamento? ¿Cuál es la gran diferencia entre el académico de hace veinte años y el actual? ¿Qué tipo de asignaturas impartías? ¿De dónde extraías la información para preparar el temario? ¿Existía algún tipo de interacción con industrias locales? ¿En qué sentido? ¿Estabas inmerso en alguna línea de investigación? ¿Cuáles? ¿A qué demanda respondían? ¿A qué dimensión respondía (regional, local, nacional, internacional...)? ¿Desde qué momento se inserta la misión de investigación en la EPSA? ¿Cómo se planificaban las tareas dentro del grupo? ¿Existe algún grupo de investigación que se toma como punto de referencia? ¿Cuál? ¿Se ha colaborado con otro grupo de investigación? ¿Cuál? Tipo de relación (corto plazo, medio o largo) ¿Se continúa?

En tu etapa como... (Empresario, gerente, vicerrector, vicedirector u otros cargos).
<p>¿Cómo interpretas las responsabilidades principales de este cargo? ¿Cuál es la situación de la Escuela cuando te incorporas como director? ¿Cuáles son los principales cambios que vives durante esa etapa? ¿Desde qué instancia se promueven los cambios que vives como director? ¿Podrías describirme algún ejemplo de ese tipo de cambios? ¿Qué tipo de relaciones Universidad-Empresa se daban antes y después de tu incorporación a la EPSA? ¿Cuáles son los principales obstáculos para que tengan lugar este tipo de relaciones? ¿Qué ventajas e inconvenientes han encontrado tras esta evolución?</p>
TERCERA MISIÓN
<p>¿Ves necesario el llevar a cabo otro tipo de actividades más allá de las de docencia e investigación? ¿Qué tipo? ¿En qué sentido ves necesario y quién debería liderar este tipo de actuación? Y Actualmente... En cuanto a los equipos que dispone el grupo ¿se ponen a disposición de usuarios externos? (definir tipo) ¿Cursos a medida? ¿Quiénes consideras que compiten con los servicios que se ofrecen desde su grupo? ¿Ha realizado o realiza algún tipo de actividad de difusión/divulgación de sus líneas de investigación, conocimientos específicos, resultados de sus proyectos... en ámbitos no académicos?, ¿de qué tipo y cuáles? (Incluir aquí actividades de fomento de la cultura científica, conferencias divulgativas, página Web de difusión de la investigación, contactos con los medios de comunicación –periódicos, revistas semanales o mensuales, programas de radio y televisión, libros divulgativos...).</p> <p>¿Qué tipo de empresas, entidades o sectores sociales o económicos (incluidas las administraciones) nacionales o internacionales pueden estar interesados en utilizar los resultados de investigación de su grupo? (Revisar los CNAE). Especificar la respuesta para cada uno de los resultados citados anteriormente:</p> <p>Las relaciones con usuarios externos al entorno académico se han dado tanto de manera formal como de manera informal. Identifique qué tipo de relaciones se englobarían en un grupo y en otro. ¿Podría realizar alguna aproximación de la magnitud de las mismas? ¿Se podría saber? ¿De qué manera?</p>

Appendix 3: Table of Interviewees

	Date of Interview	Interview duration	Sir/Lady	Recorded	Knowledge Area/Background
<i><u>Institutional/Managerial level (university managers)</u></i>					
Interview 1	November 3rd, 2009	39' 04"	Sir	Yes	Textile Engineering/Management
Interview 2	December 3rd, 2009	around 30'	Sir	No	Economics/Business Administration
Interview 3	December 4th, 2009	2h 26' 02"	Sir	Yes	Mechanical Engineering
Interview 4	March 17th, 2010	1h 29' 45"	Sir	Yes	Mechanical Engineering
Interview 5	June 25th, 2010	1h 02'	Sir	No	Mechanical Engineering/Management
Interview 6	June 26th 2010	around 1 hour	Lady	No	Business Administration
Interview 7	June 28th 2010	38' 09"	Sir	Yes	Electronical/Mechanical Engineering
Interview 8	October 20th, 2011	57' 56"	Sir	Yes	Economics/Business Administration
Interview 9	July 18th, 2013	52' 36"	Sir	Yes	Paper Engineering
<i><u>Academic Level (academics)</u></i>					
Interview 10	May 19th 2010	1h 42' 43"	Sir	Yes	Telecommunications Engineering
Interview 11	February 18, 2011	around 30 minutes	Lady	No	Textile Engineering
Interview 12	February 28, 2011	1h 33' 14"	Sir	Yes	Textile Engineering
Interview 13	March 10th, 2011	1h 30' 09"	Sir	Yes	Mechanical Engineering
Interview 14	May 18th, 2011	Around 1 hour	Lady	No	Business Administration
<i><u>Key interesting individuals (with a historical overview of the institution)</u></i>					
Interview 15	June 19th, 2009	around 30"	Sir	No	Philosophy
Interview 16	June 27th, 2010	2 sessions of 2 hours each	Sir	No	Textile Engineering
Interview 17	February 18, 2013	around 1h	Sir	No	Human Geography
Interview 18	May 17th, 2013	around 2 hours	Sir	No	Philosophy

Appendix 4: A short summary of one person's testimony who was in charge of the Secretariat of the Industrial School of Alcoy during more than twenty years within the dictatorial regime period

The discussion started mainly on the period after the war, that is, from the decade of the 1940s. At that time it was called the School of Industrial Experts and classes were often at night than during the day and most of the students were working in factories. On the other hand, some of the teachers also played its duties on behalf of a factory, either on its own or on behalf of others.

His life

He begins his first years of life with a tremendous tragedy, the death of his father. According to him, that tragedy was due to the troubles that led to the civil war, since the entire factory was dismantled and then destroyed. This meant he had to live a very hard childhood, while a door would open to the fact of being an "orphan of the Crusades", a term used for children who had lost relatives in the war that took place between years 1936 and 1939.

After a small school failure, his family, which had a mechanical workshop, advised him to join the Industrial School, having to be recommended to the authorities of the time to access it. After finishing his studies, he combined tutorials giving some of his friends and neighbors of the town, along with its entry in the faculty by the figure of "teacher merit". That meant he could be part of the prestigious Industrial School staff, despite not

receiving any financial compensation. The course he taught during those years was the Math. There were two main reasons that led him to teach at other schools and local individuals: first, the need for income, and vocation to transmit their knowledge to other students. So much so he came to teach at *Instituto Cotes Baixes*, at *Colegio La Salle*, and *Colegio Salesianos San Vicente Ferrer*.

This person was a man who devoted almost all of his time to teaching and it was recognized by the faculty of the School of experts when he was appointed acting assistant professor by decree for a period of four years plus four, i.e. 8 years in total, after which he had submitted to the opposition if they left, which they did. Anecdotally, we might say he won these oppositions (in 1968) to which the future director of the School (and city councilor of Alcoy) D. Emilio Corbí failed, a fact that should not lay the foundation of a close friendship between the two, although the interviewee felt that if they maintained a cordial relationship. After winning this opposition he got the chair on Mechanics.

The School

In the Official State Bulletin (BOE) of 1880 points put that will only be required knowledge on Trigonometry to access to Civil Engineering studies.

At the dawn of the twentieth century the education competences became an affair of national state and longer so dependent on the local, provincial and business associations. However, there is still a link between these local organisms that continue, but not with the effort of the past, to support the work of the school and research.

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In 1902, after a Royal Decree²⁹ the *Escuela Superior del Trabajo* was established, being one of four created at national level (Valladolid, Palma de Gran Canarias, Alcoy and a fourth, not remembered by the respondent).

By that time the number of people in the school did not exceed 60 members, between teachers and students. In total there were an average of 15 teachers and about 35 students, which surprised the students of today, accustomed to both classroom overcrowding, and the faculty and staff.

Final Projects

Final projects have been one of the most common instruments for quality assessment of industrial education because that depicted by a unique project all the knowledge acquired during the learning stage. However, there are two different stages in the use of this tool. While it is true that trying to implement the student's knowledge, ideas for the realization of the same were fully centralized and mediated by mere “national” needs, at least in the first half of the twentieth century, and until the arrival of the incorporation of the School of Alcoy to the Polytechnic University of Valencia. During this first stage, those “national” needs were transmitted to the managers of the Industrial School by some letters sealed with the request that was made by the central government. All the projects proposals had to be accepted and carried out by the student, who opted for a prize that was worth the potential reward to work if they were selected. But it was not

²⁹ Through a Royal Decree (of August the 17th in 1901) the Escuelas Superiores de Industrias were created in Madrid, Alcoy, Béjar, Gijón, Cartagena, Las Palmas de Gran Canaria, Vilanova y la Geltrú, Tarrasa and Vigo. <http://www.epsj23.net/historia.html>

only that, but during this time both the curriculum and examinations came dictated by the *Ministerio de Instrucción Pública*. In parallel to his process, there were some scholarships and awards sponsored by local companies and were, as far as possible, used by students.

The Context

During the World War II period the typical products manufactured by local industry were: blankets, towels, paper (smoking) and tablecloths. In terms of sectors Metal, Textile and Paper are predominant, taking off from that time. The most important factories are *Rodes y cía.*, *Blanes*, *Ferrándiz y Carbonell* (where the current university branch of the UPV is established) and *Aceitunas La Española*.

A strong relationship is found between the different spheres of society: church (closely linked to primary and secondary education), local government, educational system, industrialists and military power, exercising a controlling function. For instance, we can remark the figure of Sir *Julio Fernández*, former military from *Galicia (La Coruña)*. This man after his time as military and because of their knowledge in mechanics would become part of the Chair of the discipline in the school and provide a very solid contacts with central government that were translated into industrial projects to undertake.

During the war, the factories were dismantled and used to build bombs for the Republican side. There were large numbers bombing churches and monuments. The school, which would change of venue for 1936, could not do so because of the war and was used as a hospital after an action of solidarity towards people Scandinavian people seeking a democratic and republican. From 1936 to 1939 was, therefore, the Swedish-

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Norwegian Hospital. From that year until the recovery of its activity as a teaching center, was used as a prison after the victory of the national side.

School activity, after a hiatus of five years (1936-1941-3) resumed again after the year 1941-3. The situation of Alcoy during the postwar stage was very hard and difficult due to the destruction of many factories. However, the need to rebuild everything, that had gone forced industrialists and local society to boost newly the local economic activity.

While industry would initiate the creation of a training school for technicians, not the same thing happen in the past, in which the employer what he was, as a rule, apprentices would be formed directly by his team. This would be a difficult placement of graduates of the school; they should find a different job than expected.

During the years 1950-1960, industries were forced to have their employees enjoy two hours of leave, so people could go to school to upgrade their skills. This was because at that time they worked every day except Sunday, which was their holy day.

Appendix 5: List of Abbreviations³⁰

- ACC:** High Consultant Council (in Spanish, *Alto Consejo Consultivo*)
- ADL:** Local Development Agency (in Spanish, *Agencia de Desarrollo Local*)
- AITEX:** Textile Industry Research Association (In Spanish, *Instituto Tecnológico Textil*)
- ATEVAL:** Textile Association of Valencian Region (in Spanish, *Asociación textil de la Comunidad Valenciana*)
- BOE:** Official State Bulletin
- CEEI:** European Centre of Enterprises and Innovation (In Spanish, *Centro Europeo de Empresas Innovadoras*)
- CFP:** The Centre of Life-Long Learning (in Spanish, *Centro de Formación Permanente*)
- CTT:** Technology Transfer Office (in Spanish, *Centro de Transferencia de Tecnología*)
- CV:** Curriculum Vitae
- EC:** European Commission
- EEIA:** *Escuela Elemental de Industrias de Alcoy* (in Spanish)
- ESIA:** *Escuela Superior de Industrias de Alcoy* (In Spanish)
- EPSA:** Higher Polytechnic School of Alcoy (in Spanish, *Escuela Politécnica Superior de Alcoy*)
- FDI:** Foreign Direct Investment
- GDP:** Gross Domestic Product
- HEI:** Higher Education Institutions
- ICT:** Information and Communication Technologies
- ID:** Industrial District
- IDEAS:** Institute for the Creation and Development of Enterprises (In Spanish, *Instituto para la Creación y Desarrollo de Empresas*)

³⁰ The following list describes the significance of various abbreviations and acronyms used throughout the thesis.

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NIS: National Innovation Systems

OECD: Organisation for Economic Co-operation and Development

PhD: Doctor of Philosophy

RCN: Research Council of Norway

SME: Small and Medium Enterprise

UPV: Polytechnic University of Valencia (in Spanish, *Universidad Politécnica de Valencia*)

VCD: Valencian Central Districts