Innovation Penetration into a Region with Specific Features:
The Case of Crete, Greece

Yiannis Nikolaidis*, Yiannis Bakouros**

Department of Engineering & Management of Energy Resources
University of Western Macedonia
50100 Kozani, Greece
fax: +30–24610–56661

* Email: inikolaidis@uowm.gr, tel: +30–24610–56700
** Email: ylb@uowm.gr, tel: +30–24610–56660

Abstract

This paper intends to map the state of the following sectors of Cretan Economy: Food and beverage, Trade, New forms of tourism, and Products of the primary sector, regarding their innovativeness. Most importantly, it aims at understanding the innovation level in a Greek Region with special features, analyzing the existing trends, recognizing the prospects, strengths and weaknesses, evaluating the influence of the recently established Cretan innovation network and, finally, suggesting areas of innovative improvement. All this information is summarised in the form of conclusions and suggestions, which will be useful for any other similar region worldwide.

Key words: Innovation, Innovation Network, Market Research, Questionnaire

* Corresponding author
Biographical notes:

- **Yiannis Nikolaidis** is a Lecturer at the Department of Engineering & Management of Energy Resources of the University of Western Macedonia and a Teaching Associate at the Department of Technology Management of the University of Macedonia in Greece. He is also a Research Associate at the Department of Mechanical Engineering of the Aristotle University of Thessaloniki, where he completed his PhD. He has been a Quality assurance consultant in a large number of companies, while since 1999 he is a Quality Systems Auditor. His research interests include quality assurance, statistical quality control, reverse logistics, business economics and innovation.

- **Yiannis Bakouros** received his Ph.D. in management and administration, in 1988, from Bradford University, UK. He has been visitor assistant professor at AUTH and University of Thessaly. He has been responsible for Thessaloniki Technology Park development. Currently, he is an Assistant Professor at the University Western Macedonia, coordinator of the initiative for Technological Cooperation with Balkans, advisor and head of Regional Innovation Strategy in Thessaly and Western Macedonia, and member of the board of directors of Thessaly Technology Park. His main research interests are innovation, technology management, regional development strategies, information management networks, reliability, maintenance, industrial health and safety.
1. Introduction

According to the Organization of Economic Co-operation and Development (OECD 1994, 1996), nowadays, every form of knowledge has an outstanding role in the economic landscape. Nations that develop and manage it effectively progress more; companies with broader knowledge systematically exhibit better performance than those with limited knowledge, while better-qualified individuals manage higher incomes. The crucial role of knowledge justifies the continuously increasing investments in Research and Technological Development (RTD), education and training, and other related, intangible investments.

If we also consider that any technological change arises from innovative activities such as RTD, and encourages further investments in improving productive capacity, it is easy to see that in the long run this creates employment positions and causes incomes to increase. Consequently, the basic duty of the State is to create favorable conditions as well as to encourage companies to invest and undertake innovative activities; both are necessary for enhancing technological change.

In an attempt to explain why technological change occurs and why companies innovate, Schumpeter (1934) has propounded the following innovation types:

- Introducing a new product, or qualitative change of an already existent one
- Introducing an innovative procedure that has novelty value in an industrial sector
- Opening a new market
- Finding new sources of supplying raw or other materials and
- Introducing changes in the administrative organization of an industry

He also underscored that companies seek profit. Understandably, innovations in products can offer the opportunity to a company to take action in a monopolistic environment, either by copyrighting the products in question (legitimate monopoly) or by exploiting the time it
will normally take competitors to follow suit. Such a monopolistic position allows a company to set higher prices on its products compared to what it could do in a competitive market, and hence to get more profit, which in turn will allow the company to invest more in RTD. *Innovations in procedures* improve the productivity of a company and, therefore, the latter gets an advantage concerning costs, in contrast with its competitors. This fact enables the company to seek more profit, either by increasing its profit margin or by setting lower prices, expanding its share of a market and, finally, achieving a higher turnover, in comparison with its rivals.

Even if it is generally accepted that the development and diffusion of new technologies are important for output to increase and production processes to become more effective, the knowledge about the procedures and the economic consequences of innovation is still inadequate. For instance, while we are amidst a great technological revolution, during which the world economy is being rebuilt thanks to new technologies, telecommunications, informatics and radical changes that happen in areas like biotechnology, material science etc., it is noticed that these fundamental technological changes do not contribute to an improvement of total factor productivity or to increase the rate of production development.

Therefore, although innovation has an outstanding position in advanced economies across the world, its procedures, particularly the sophisticated ones, have not been sufficiently understood until now. However, there has been a while since the situation started to change, mainly as a result of relevant research studies: for example in Dodgson and Rothwell (1994) and Stoneman (1995) one can find very important reviews of all the studies on innovation in the early 90s, while Freeman (1994) has given additional information about the economic consequences of technological change.

The last few years the efforts to understand innovation process focus on the vital importance of certain stages. More specifically, they have focused on the stages that affect
the diffusion rate of new technologies. However, in that area serious difficulties are encountered due to the lack of credible, organized data. Actually, the potential of conducting a detailed analysis of innovation as well as of managing the problems that have to do with the design and implementation of a policy, depend, partially at least, on the improvement of the available information.

1.1. Innovation in Greece and, specifically, in Crete

According to the reports of the European TrendChart on Innovation (2004a, 2004b) the innovativeness of Greek companies during that period was the lowest among the, then, 15 EU member states. In comparison with the average of the EU, Greek companies boasted high innovativeness only in the sector of “PCs and relative kinds”.

To illustrate this, the report of the Management Science Laboratory of Athens University of Economics and Business (2003) regarding Regions of Greece, reveals that the development of regional innovation policy in Greece is at an early stage. In the degraded innovation environment of Greece, intense centralization of RTD activities and innovation can be noticed mainly in Athens, and much less in Thessaloniki and Crete: from 1991 to 1993, the foregoing areas raised approximately 80% of the net expenses of Greece for RTD. Note that apart from the two big cities of Greece, the island of Crete constitutes the only Region of Greece enjoying the privilege of comprehensive RTD activities. This fact can be easily explained if someone bears in mind the research background and the economic resources that are gathered in those three areas. It should be emphasized that the regional distribution of resources for research and innovative activities were almost nonexistent in Greece a few years ago. The only Regions that could be marginally excluded were Crete, Central Macedonia and Thessaly.

Additionally, the annual innovation policy report for Greece of the European
TrendChart on Innovation (2004b), presents the regional data of innovation in Greek companies, regarding the period September 2003 – August 2004 (Table 1). This table shows that 23.1% of Cretan companies have introduced at least one innovative activity, which is a percentage that ranks Crete in the sixth place in Greece. This percentage increases in companies of the industrial sector (28.4%), while in the services sector the respective percentage is much lower (2.6%).

Table 1 about here

More specifically, the study of the Centre of Entrepreneurial and Technological Development of Crete (CETD 2004) outlines the basic indexes and trends of the Cretan economy, giving more details about innovation in Crete. An important piece of information of this study has to do with the deceleration of the development rate of Crete in comparison with the other Greek Regions. However, this Region generally provides a satisfactory picture regarding its competitiveness and a proof of this is that in 2003 it produced 5.3% of the Greek gross domestic product and saw an average annual growth of the regional product of 6.5%. At the same time the Primary and the Tertiary Sector are very important in Crete, while the Secondary Sector seems to be afflicted with a serious handicap. Regarding the productivity of the island a continuous improvement has been noticed lately, while the intension of Cretan entrepreneurship is very close to the Greek average.

By and large, focusing on the Cretan entrepreneurship, the same study mentions the satisfactory efficiency of venture capital invested there, the sufficient administrative and productive infrastructures (e.g., industrial and small industrial areas), as well as the effective structures of supporting entrepreneurship (e.g., CETD, Chambers, Department of Design and Development of the Region of Crete etc.). Besides, Crete develops continuously its technological, research and scientific environment, trying to be consistent with the strategic target of rendering the island a research centre of the Southeast
Mediterranean Sea. On a similar note, the study reports that 9.53% of the total government expenditure on Scientific and Technological research in Greece is earmarked for Crete; this fact ranks Crete in a very good position, compared to the whole of Greece.

Considering the indicative information mentioned previously, one can see that the Region of Crete constitutes an area with specific features, regarding innovation and entrepreneurship. These features can be classified as positive or negative, and are summarized as follows:

- **Positive features – advantages of Crete:**
  - There is intense activity in business sectors that can be competitive worldwide, such as:
    - Tourism, where there are favorable conditions for its development, namely climate, tradition etc. and
    - Agriculture, with extensive experience both in traditional and biological methods.
  - Academic – research institutions
    - conduct internationally competitive research in new technologies like biomedicine, biotechnology, lasers etc.
    - invest more in research in comparison with institutions of other Regions, and participate frequently in national, European and international RTD programs.
  - There is high quality infrastructure and specialized staff for research and development.
  - High quality of life in Crete can attract well-qualified human resources from all over EU.
- **Negative features – disadvantages of Crete:**
  - Secondary Sector and in particular technology-based industry of Crete is degraded since very few companies can be deemed to be highly technological.
o Absence of an integrated strategic plan for a regional policy on research and development, as well as innovation.

o Non-advanced entrepreneurial orientation and collaborative spirit, with limited number of spin-offs and, generally, limited entrepreneurship of researchers and academics.

o Limited flow of technology and knowledge from academic – research institutions to Cretan companies.

o Companies suffer from lack of information about the potential support of their technology from academic – research institutions.

o Crete is far away from the central national market, as well as from the main European ones.

o Lack of funds from the private sector and limited foreign investments, as well as low impact on Cretan economy from national funding programs.

The remark of Carayannis and von Zedtwitz (2005), which referred to advanced developing and transitioning economies – countries, is also true for Crete, which can be considered a developing area: the challenge and the opportunity in particular for Crete is to evolve and possibly pass from lower to middle income, knowledge-, technology- and know-how-importing and using area to high and sustainable income, knowledge-, technology- and know-how-generating and exporting one. For such a transition to be effective and sustainable, the Cretan innovation network constitutes a key success factor.

The latter was also the most significant conclusion drawn from all three important EU programs that have been lately conducted in Crete, such as a) RITTS (1997-2000), focusing on the competitiveness of local SMEs and their production reforming, b) InnoRegio (1999-2001), focusing on methods and techniques of innovation development and management and c) CRINNO (2003-2005), aiming at the introduction of innovative practices regarding
the management of the natural resources of the island, the support of entrepreneurship and the safeguarding of the regional and traditional identity of the island, by strengthening the Cretan innovation network. Those programs concluded that the effectiveness of the aforementioned transition - evolution of Crete would depend, a lot, on the efficiency of the innovation network that had been created during that period of time. This network could contribute to upgrading the Cretan economy and the society in a “knowledge economy and society”, which could “ ... leverage intensively and extensively knowledge assets and competences as well as economic learning to catalyze and accelerate sustainable and robust economic growth” (Carayannis et al. 2006).

As regards the innovation networks, these are defined analytically by Carayannis et al. (2006): “Innovation Networks are real and virtual infra-structures and infra-technologies that serve to nurture creativity, trigger invention and catalyze innovation in a public and/or private domain context”. Particularly in Crete, the local innovation network consists of Academic Institutions, Research and Technological Institutions, Technology Transfer and Innovation Support Centers, Development Agencies and Public Organizations. The members of the Cretan innovation network are presented schematically in Figure 1.

\emph{Figure 1 about here}

\subsection{1.2. The project}

The \emph{project} that is presented in this paper was realized at the end of 2005 by CETD, with the scientific support of the Management of Technology Research Laboratory – MATER (http://www.materlab.eu) and was one of the “Innovation Studies in specific branches of the Economy of Crete”. The aims of the effort were to map the state of Cretan companies belonging to the important sectors of a) \emph{Food and Beverage}, b) \emph{Trade}, c) \emph{New forms of tourism}, and d) \emph{Products of the Primary Sector}, in relation to their innovation
level, as well as to evaluate the influence of the Cretan innovation network in the innovativeness of those companies. More specifically, the ultimate target of the project was to understand their innovation level at the specific period of time, analyze the existing trends, recognize the prospects, strengths and weaknesses, identify the innovation implementations and the best practices in those particular sectors of the Economy of Crete and finally point to areas of innovative improvement. All these were done in the light of the recent establishment of the innovation network of Crete, while data and information are summarized in the form of conclusions and suggestions, and constitute useful “do’s and don’ts” for any other similar region around the globe.

In the following section, we present a brief literature review of surveys concerning innovation. Then, we mention the stages of the research methodology (Section 3), while in Section 4, we refer to the results of the market research, giving emphasis on the various sectors examined as well as the innovative and potentially innovative companies. Subsequently, we present the conclusions of our research and suggest actions that should be taken for the improvement of the innovativeness of companies in any area that has similar features to Crete (Section 5).

2. Literature review

During the first stage of the project the methodological approach was theoretically documented. More precisely, the theoretical documentation was conducted through the review of the relevant international literature, as well as the Oslo Manual, which proposes guidelines for collecting and interpreting technological innovation data and the Frascati Manual, which proposes standard practice for surveys on research and experimental development. Note that both manuals constitute tools that Eurostat and OECD use extensively.
Over the last decade there have been a few surveys concerning innovation and entrepreneurship all over the world. Taking into consideration that since 1989, the Polish economy has been transformed to a market economy, where innovations constitute key instruments of the changes of the system and the economic development, Baruk (1997) tried to answer the following question: to what degree the changes of the Polish economic system have generated increased innovativeness in companies. He based his study on the results of a research questionnaire concerning the innovativeness of the Polish industry, carried out by the Central Statistical Office of Poland among 2,430 firms belonging both to the public and the private sector. In Finland there has been a quite extensive object-based\textsuperscript{1} technological innovation survey, conducted by VTT – Group for technology studies, which was presented by Palmberg et al. (1999). The main idea of this survey was to understand better the development processes taking place in the Finnish industry.

Koschatzky et al. (2001) using empirical data from a postal industrial innovation survey that was carried out in the Republic of Slovenia among industrial companies, business-related service companies and research institutions, analyzed structural characteristics of the Slovenian manufacturing industry and its innovative behavior. A few years later Ulusoy (2003) assessed the supply chain and innovation management in the manufacturing industries in Turkey on an empirical basis. The assessments that he presented were based on parts of the data and information collected through the Competitive Strategies and Best Practices Benchmarking Questionnaire, distributed in 82 companies from four sectors of Turkish industry.

Zhou (2006) compared the effects of innovation and imitation strategies on new product performance. He also examined their contingency across different market conditions in light of China’s unique market characteristics. The empirical results from a

\textsuperscript{1} which refers to a market novelty, in contrast with the subject-based, which refers to the company level
cross-industry survey showed that an innovation strategy leads to better new product performance, compared with an imitation strategy.

Finally, in an important recent research study, Mohnen et al. (2006) tried to compare the innovation performance of seven European countries, namely Belgium, Denmark, Germany, Ireland, Italy, Netherlands and Norway, using data from 8,146 firms, which Eurostat assembled and harmonized in micro-aggregated form, for reasons of statistical confidentiality. In effect, except for contributing to the analysis of the information provided by innovation surveys and the improvement of their design in the future, they helped organize everybody’s thinking on measurement and comparison of innovation performance.

3. Research Methodology

The next stage of the project dealt with the empirical adjustment of theory to the true practices of Cretan entrepreneurship, taking into consideration the special features of the Region of Crete mentioned previously and those of the four sectors of interest. In other words, the theoretical – technocratic approach, which is generally accurate but is also static, was combined with the experience of Cretan entrepreneurship.

Taking into consideration the Cretan business environment it was decided not to conduct the main and analytical field research in all Cretan companies in the sectors examined. The reason for this choice was that Cretan companies that had reached such a point of development as to deal with matters of innovation, strategic management and organization were quite a few. On the contrary, most companies in Crete were simply interested in sales, logistics and investments in fixed assets. Consequently, a telephone research, surveying all Cretan companies in the sectors examined, was considered more appropriate as a start. After that, those companies appearing to be interesting, i.e. the
innovative or the potentially innovative ones, and probably able to answer questions about innovation, would participate in the analytical research.

For the purposes of the telephone research, a short, one-page questionnaire was formed and filled. However, the questionnaire of the analytical research was thorough (fourteen pages) and was based on the questionnaire of the Fourth Community Innovation Survey (CIS IV), as well as on questionnaires used in relevant researches and projects that took place in Greece in the past.

The methodology that was used for determining the statistical population of companies participating in the project, as well as the sample that was examined during the telephone research, was the following: first all the companies that belonged to the sectors of interest were traced mainly through Chambers and telephone directories, and then they were recorded, without any exception. The numerical allocation of companies per sector is presented in Table 2. For practical reasons, namely the completion of the telephone research according to the schedule of the project, a random sample of 2,874 companies (i.e. 54% of the total number of companies) was determined by simply limiting the numerous, anyway, trade companies.

Table 2 about here

4. Results of the Market Research

The results of the telephone research came up after the elaboration of the data that were collected from 1,135 companies (response percent: 39.5%). Approximately 37% and 67% of those companies were founded in the last 10 and 20 years, respectively. Excluding the last five years, one can recognize a continuously increasing rate of new companies’ foundation, as time goes by (Figure 2).
Regarding employment, it is shown in Figure 3 that the overwhelming majority of companies (about 74%) employs up to 5 workers, while the average number of employees in all the companies that took part in the telephone research is about 6.5 persons, which is a fact that shows the small size of Cretan companies: according to the classification of Regulation 70/2001/EC, EU considers as Very Small companies all those companies that employ up to 10 employees. Consequently, 86.31% of Cretan companies are characterized as Very Small companies, while as Large, i.e. the ones that employ more than 50 employees, just 1.2% of the total.

Almost half of the companies (48%) do not employ personnel and their human resources are exclusively the companies’ owners. Regarding the number of higher education graduates (Figure 4), in the vast majority of companies (about 76% of the total) the percentage of University or Technological Education Institute graduates is 10% of the total at most, while the average percentage of higher education degree-holders is 11.16%. Just 5.63% of companies occupy higher education graduates at a percentage more than 50% of their total number of employees.

Regarding the penetration of basic Information and Communication Technology (ICT), 60% of Cretan companies use PCs. However, this percentage is reduced when it comes to access to Internet: the relevant percentage is nearly 42%.

Only 10.14% of the companies that took part in the telephone research have developed and certified a quality management system (QMS). Approximately half of them (52.59%) were certified according to one of the ISO 9000 standards, while the percentage of them that were certified according to an additional standard also, amounts to 18% (Figure 5).
The percentage of companies that introduced a new product or service in the market during the last three years is very low (11.14%), while the relevant percentage of companies that introduced an organizational innovation is slightly higher (14.74%). Those percentages differentiate more or less depending on a) the age of companies, b) the number of their employees and c) the percentage of graduates.

Surprising enough, companies that have been founded recently, i.e. after 2000, innovate less (the percentages regarding new product – service and organizational innovation are 10.71% and 9.88% respectively) than the older companies (the respective percentages are 11.54% and 16.10%). This happens probably because newly established companies face primarily issues of business viability instead of innovation ones. On the other hand, only 9.37% and 12.8% of companies that employ up to 5 workers have introduced a new product – service or an organizational innovation respectively. These percentages improve significantly (24.86% and 42.44%) for larger companies. Obviously, the larger the size of a company is, the better it is regarding its innovativeness. Finally, the larger the percentage of its graduates is, the more innovative a company becomes. More specifically, 16.06% and 24.91% of companies that occupy higher education graduates at a percentage more than 10% of their total number of employees, introduced a new product – service or an organizational innovation in the market during the last three years, respectively. The aforementioned percentages reduce considerably (9.62% and 11.57%) for companies occupying graduates at a percentage less than 10%.

Note also that only 3.6% of companies participating in this research have been funded for the introduction of an innovation and that is probably the reason for their unwillingness to innovate. Fortunately, there are many more companies (26.29% of the total number) that have been convinced about the need to introduce new products, services and organizational
innovations in the future.

Furthermore, the lack of communication and co-operation between companies and academic – research institutions should be emphasized, since less than 5% of companies have been in touch with the latter.

Regarding target markets of companies and their geographical distribution, it is evident from Figure 6 that two out of three companies address exclusively the local market, whereas about 10% operate at either the local or the regional level. Only 6.58% of companies stated that they export their products.

*Figure 6 about here*

Finally, almost half of Cretan companies (51.78%) have an average annual turnover ranging between 50,000 € and 500,000 €, while 32% of them have a larger average annual turnover by one order of magnitude, i.e., between 500,000 € and 5,000,000 €.

The results of the research are differentiated in both telephone and analytical research depending on the examined sector. Thereafter, we refer to the results of the market research, giving emphasis on the various sectors examined as well as the innovative and potentially innovative companies (analytical research).

### 4.1. Food and Beverage sector

According to the results of the telephone research in 160 companies operating in the Food and Beverage sector, the period 1990 – 1995 was the one with the highest rate of such start-ups. During that period 17.45% of the total number of those companies was founded. About 61% of companies are younger than twenty years old. In contrast with the image of the total number of companies that were examined in the telephone research (Figure 2), which presented a continuously increasing foundation rate, a significant fluctuation can be noticed in the foundation rate of Food and Beverage companies from
one period to another.

A 75% of this type of companies is considered Very Small. Nevertheless, the average number of employees is about 13. This number is fairly higher than the similar number corresponding to all responding companies of the sample (6.38 employees). Based on the analysis of the research results regarding the innovative and potentially innovative companies, it should be stressed that although each innovative company employs as many as 95 people, R & D departments are barely staffed with only two employees, on average. Generally speaking, the average percentage of employees holding a higher education degree is estimated to be 9.65%, which is lower even than the already low percentage of the total number of companies (11.16%).

Concerning the use of PCs and the access to Internet, the image of the Food and Beverage companies is similar to the total: 57.5% of companies use PCs, while the percentage of companies that have access to Internet is about 41%. On the contrary, the companies of this sector are fairly more sensible than all the rest, regarding their quality and the implementation of QMSs: companies representing nearly 31% of the total have certified their QMSs. In actuality, two out of three of them (64.58%) implement HACCP, while 27.08% of them, except for HACCP, have certified an ISO QMS also.

A 35% of the Food and Beverage companies have introduced a new product in the market, which constitutes a much more impressive percentage in relevance with the total sample of companies. On the other hand, the percentage of companies that have introduced an organizational innovation is considerably lower (15%). Note that only 5.63% of the total has been funded for the introduction of an innovation. Of course, there are many more companies that have understood the need of introducing new products, services and/or organizational innovations in the future (32.5%).

The study of Food and Beverage companies has confirmed the absence of
communication between companies and academics: only 8.13% of the total number of these companies had or still have a relevant experience.

Regarding “openness capabilities”, the situation seems to be favorable, since almost 19% of companies are exporting goods and 27.5% of them appeal to the national market. The relevant percentages for the innovative and potentially innovative companies are 57% and 66%, respectively. Furthermore, an important percentage is certified as far as quality, hygiene and security are concerned: 30.6% of the total number of Food and Beverage companies and 71.4% of the innovative part of them. However, one would expect even higher percentages, considering the particular character of this particular sector.

In terms of product innovation, performance is not satisfactory, as only half of the innovative and potentially innovative companies have taken corresponding initiatives over the last three years. The majority of these product innovations involved small-scale internal activities, with limited collaboration with other organizations or institutions. Besides, 72% of the annual turnover comes from unchangeable products or products with few modifications. The performance in process innovations is better, since nearly 57% takes relevant initiatives in the form of larger-scale collaboration with other companies or institutions than those in product innovation.

The dominant positions in the list of the innovative activities “preferred” by innovative and potentially innovative Food and Beverage companies, are held by the purchase of technological equipment and software, training (internal and external), as well as internal research and development. The average total annual expenditure on this kind of activities is approximately 450.000 €. In terms of organizational and marketing innovation, the situation is even more promising, while as for the factors – obstacles to innovative activities and plans, the respondents consider high costs and the absence of external funding as the most important.
4.2. Trade sector

The results of the telephone research for this type of companies derived from the elaboration of data that were collected from 945 companies. Since trade companies constituted the majority of companies participating in the research, namely 82.6% of the total, it is reasonable for this category to have results and trends similar, to a great extent, to those of the total number of companies.

With the exception of the last five years, a continuously and highly increased rate of establishing new commercial companies is noticed in Crete. Most of them (about 80%) employ up to 5 employees, while only 0.38% of them can be characterized as Large companies. The average number of employees in the trade companies is 4.77, which is lower than the average of the total sample (6.38 employees). More than 72% of companies target exclusively the local market, while about 23% sells at least at the regional market.

52.48% of companies have no staff and rely on the owners’ work, while the percentage of employees holding a degree of higher education is quite low. There is limited proliferation of QMSs and a proof of this is that only 5.82% of companies are certified. About 14% of the trade companies incorporated innovations during the last three years, while there is almost absolute absence of co-operation with academic – research institutions, given that only 3.17% of the total has ever had such a contact. Regarding the penetration of ICT, nearly 60% of the trade companies use PCs, while the percentage is lower concerning access to Internet (40.53%).

In particular, innovative and potentially innovative commercial companies achieve high rates of sales increase, whereas they appear to be “open” enough, given the nature of their sector. On the other hand, there is enough room of further spread of QMSs. The creation rate of new or substantially improved services is relatively high; however, these processes take place under conditions of isolation: up to 70% of innovations are developed
internally. Despite the fact that the extent of originality of innovations observed is relatively satisfactory, the annual turnover derives mainly from services that remain unchangeable or are marginally altered from time to time.

Regarding process innovations, the current situation is not favorable and is restricted, mostly, in the implementation of new or substantially improved supporting activities. In reference with the kinds of innovative activities which the innovative and potentially innovative trade companies prefer, one can see that the purchase of machines, equipment and software, as well as the internal research and development have a dominant position. The characteristics of the innovation expenses depict an average of 91,000 € annually, as well as absolute dependence on self-funding. Internal sources emerge as the most important sources of information, followed by suppliers, customers, consultants and commercial expedition. Cost and lack of skilled staff are the most important factors discouraging commercial companies from assuming innovative activities. Last but not least, organizational innovations are implemented to a great extent, leading to advantages such as the improvement of customer satisfaction, as well as of the quality of products or services.

4.3. New Forms of Tourism sector

The outcome of the telephone research for this sector derived from the elaboration of the data collected from 20 companies offering new kinds of tourism services, mostly travel agencies organizing adventurous excursions in the countryside, conference centers and other organizations in the business of recreational and sport activities.

Most companies of this category (72.22%) have been established during the last 20 years. Concerning the relation between the companies and the number of employees, this category of companies is in a relatively better situation in comparison with the other types
of companies of the project. More than 31% of them employ at least 10 persons and almost 19% of the total employs 15 to 20 persons. The positive picture of this sector is consistent vis-à-vis the percentage of higher education graduates: 26.32% of companies employ staff of higher education at a percentage of 40%–50% of the overall staff, while almost 5.26% of them occupy exclusively staff of higher education.

In relation to the use of PCs and Internet, the picture is absolutely positive: 95% and 90% of companies of this sector use PCs and have access to Internet, respectively. On the contrary, as far as quality management in concerned, only 20% of companies have obtained relevant certificates. Regarding the introduction of new innovative services and organizational innovations, a reported average of 75% has not taken such initiatives during the last three years. In the near future, however, 55% of them believe that they will work on it. In addition, limited co-operation between companies and academic – research institutions is observed: 85% of the former reported that they have never had any contact with such foundations. Finally, “openness” of those companies seems to be strong enough, given that 80% of them target the international market.

Especially the innovative and the potentially innovative companies belonging to the New Forms of Tourism sector have displayed a high rate of sales increase lately and at the same time they are quite “open” towards the national and, most importantly, the international market. Even in this remarkable part of companies, the extent of penetration of QMSs is low, while there is a high rate regarding the introduction of new or substantially improved services, namely eight out of 10 companies took such initiatives over the last three years. Nevertheless, there is enough room for further activation in the direction of innovation, as 70% of the annual turnover continues to derive from services that remain unchangeable or are marginally altered from time to time.

The performance as far as the process innovations are concerned is mostly related to
the introduction of new or substantially improved methods of developing this kind of innovations, as well as of distributing practices or methods. The kinds of innovative activities that the companies of the sector of New Forms of Tourism prefer, concern primarily internal research and development, purchase of machines, equipment and software, training and, finally, activities for the introduction of innovations into the market. The annual expenditure on innovative activities comes up, on average, to 150,000 € and is not supported by public funding.

The most important sources of information for innovative and potentially innovative companies seem to be the internal ones, as well as reports and specialized technical publications. The most important factors blocking innovative activities are the lack of both external and internal financial sources, and of qualified staff. Lastly, the organizational innovations display better performance than market innovations, whereas the improvement of quality of services and customers’ satisfaction prove to be the most important result—benefit arising from their implementation.

4.4. Primary Sector Products

The elaboration of the results of the telephone research was based on information collected from the remaining companies producing Flowers and Nursery Garden Products, Aromatic Plants, Organic Vegetal Production and Poultry Farming. The main characteristics of the majority of them are their medium size, as they employ more than 16 working persons on average and their local and regional market orientation.

These companies do not have an R & D department; hence innovation and research activities are limited in terms of intensity. The educational level of their human resources is also low, since most of them (78%) employ highly educated personnel at a percentage less than 20% of their total force. Taking into account their medium size, the usage of PCs
and Internet is considered normal because 89% and 67% of companies, respectively, make use of them. It should also be noted that 40% of them has had their QMS (mainly according to the ISO series) certified. Only 11% of this category has introduced or plans to introduce new products and organizational innovations and an equal percentage of them was in the past or is today in touch with academic – research institutions for reasons related to innovative activities. It is also illustrative to mention that only 10% of this type of companies has been funded for innovative activities.

As far as innovative and potentially innovative companies are concerned, it should be mentioned that despite their high rates of sales increase (almost 31%), their “openness” is quite limited. In terms of product innovation, the percentage of companies creating new products or services is remarkably low, in contrast to process innovations where nearly two out of three companies take relevant initiatives. Regarding the kinds of innovative activities which the companies of the Primary Sector prefer, internal research and development, purchase of machines, equipment and software, and training have dominant position. The average annual expenditure on innovative activities comes up to 110,000 €, in most cases without public funding. Internal sources stand out as the most important sources of information for innovative activities, while suppliers, competitors or other firms of the sector and commercial expeditions follow on the list. The most important blocking factor for innovative activities and plans is the absence of the necessary human resources, as well as the prohibitive cost of innovative activities. Finally, applications of organizational and marketing innovation are not encountered frequently and relevant initiatives characterize only three out of 10 companies. An exception to this pattern seems to be the introduction of changes in the design or package of product, which happens much more often.
5. Conclusions - Suggestions

The presented project has demonstrated that the structural characteristics of Cretan business environment, where Very Small and Small companies dominate the market, are particularly restrictive. Almost half of the companies depend exclusively on the owner’s work and do not have any employees, while three out of four employ less than five persons. Larger firms, employing a considerable percentage of highly educated executives and having a well-organized R & D department, are rare. Obviously, this sort of pattern stresses mainly issues of business viability and is difficult to foster the innovation process. Therefore, the performance in the development and application of innovation, in the sectors of interest, is considered marginal.

In Crete and all other areas like Crete, it is necessary to set a plan of mass transformation of the numerous Small and Very Small companies – which have limited capability and serious organizational and financial problems – into Medium-sized, at least, companies. The latter, not only have better potential and adequately competitive size, but they can also give an important boost to the Cretan and, consequently, to the Greek Economy. Of course, this goal requires an enormous effort both in the improvement of the co-operation mentality and in studying the terms of collaboration-consolidation.

The small and medium size of companies sets also the need for clustering: the systematic, better than ever before, growth of clusters is indispensable. Previous experience has showed that clusters cannot be enforced, but can be very successful either if they are based on constant efforts on the long run or if they come up spontaneously from business initiative. As long as the need for creation of a critical mass of clusters exists, the collection of powers for a) the support of collective initiatives, b) the development of a collaboration mentality and c) the growth, in the long run, of viable clusters, is necessary. Clusters are conducive for development and competitiveness.
At the time of the project, it was evident that crucial economic, institutional, bureaucratic etc. problems were blocking the efforts for development and flexibility. Preserving or inadequately treating those weaknesses will always impede entrepreneurship on its way to developing competitive advantages. Thus, the innovation issue must be addressed decisively and become one of the top priorities for business and socio-economic development.

Additionally, it was recognized that at regional level, all the authorities, organizations, structures and mechanisms serving entrepreneurship, as well as innovation, act in a haphazard way. It is obvious that the absence of collaboration, co-ordination or even of one formal, widely accepted and specialized coordinating body is a very important constraint that, among other things, is stifling the companies’ year-on-year expectations, self-confidence and optimism.

The existence of a large number of academic – research institutions in Crete, although it is a blessing, it has not been turned into a strong advantage for local companies. The linkage between the latter and universities is still limited, thus, most great achievements of research bodies are not channeled to business organizations, revealing the inadequacy and the inefficiency of the recently established innovation network of Crete. Only a small part of the research achievements are incorporated in the market, by some Medium-sized and Large companies. This paradox, deriving from a significant but unexploited regional advantage, calls for radical and immediate measures if companies are to follow up the tremendous speed of changes (e.g., the Lisbon Strategy, the 7th Framework Program for RTD etc.).

Cretan companies should realize that PCs and Internet have ceased to be a luxury and that, nowadays, they constitute very important tools that influence every company’s activity. Despite the relatively good performance of Cretan companies in that sector,
further diffusion of such means and a higher rate of adopting modern technologies as well as applications of informatics and telecommunications are imperative. For example, the installation of integrated management information systems for Enterprise Resources Planning – ERP, or for internal organization and management, like Management Information Systems – MIS, Warehouse Management System – WMS etc. could help companies evolve.

The frustrating picture of a negligible number of Cretan companies with a certified QMS should change as soon as possible. Even if there have been lately plenty of co-financed programs of supporting those actions, the results of the project show that the effort should be continued, especially in handicapped sectors like Trade, New Forms of Tourism and Primary Sector Products. In these sectors, there should also be better dissemination of information regarding quality labeling and certification.

The quality of human resources is always significant because, at the critical moment of applying any system, decision etc., everything depends on the human factor. The attainment of high-level human resources demands ad hoc training, which needs to be planned, supervised and evaluated, and should take place both inside the company, with the means and powers of the latter, as well as with government assistance.

As far as the innovation dimensions are concerned, namely product, process, organizational and marketing innovation, the research has shown that organizational innovation is the most common in Crete, while Cretan companies innovate less at the product level, i.e., technologically. This point raises skepticism about the kind of innovation that the Region in question is endeavoring to achieve. In this way, it would be more efficient and, consequently, advisable to first bridge the gap between the various companies as to organizational innovation, in which performance and comparative readiness of companies are much better, and then deal with product and process
innovation. Those actions call for a new series of co-financed programs for innovation and RTD, better adapted to existing needs; the new programs must promote actions, technical evaluations, studies, marketing techniques, consulting services and vocational training in management, entrepreneurship and marketing.

All in all, the Region of Crete displays a disappointing innovation capacity and an important reason for this is that the recently established innovation network has not worked successfully until now; although, before the project presented in this paper, there has never been another market research at this Region on companies’ innovativeness, the information collected revealed that the Cretan innovation network has not been as effective as expected. Of course a marginal improvement of innovativeness cannot be questioned.

However, some of the leading companies at national or even European level can be found on the island, which must be encouraged on a constant and steady basis, for they have successfully overcome difficulties, developed competitive advantages and incorporated innovation, earning respect in profitable and niche markets all around the world. Also, supporting new companies on their way to creating and developing innovation advantages is of utmost importance. This kind of entrepreneurship leads the way and offers good practices and useful experiences to others, improving the business environment.

Poor performance in terms of innovation dictates the need for long-term planning and “capitalization” of experiences and achievements of the past, on behalf of both the State and regional members of the innovation network. Important progress is not possible to happen shortly, as neither does the present companies’ performance allow it, nor does innovation itself come after short-term interventions. However, the existence and most importantly the reinforcement of the innovation network will certainly contribute towards the desired direction.

Finally, cultivating innovation mentality is necessary. The example of countries like
Finland, Ireland, Italy, the USA, or countries of East Asia etc. shows that innovation mentality ought to be fostered in the first educational stages (primary – secondary school) and then it should be noticeably enforced and specialized in higher education. Overall comprehension of the importance of such an effort constitutes a primary issue that equals those pertaining to a company’s viability and competitiveness.

Considering that innovation constitutes the driving force for developing productivity and improving competitiveness, in areas with the same features as Crete companies should then undertake the following initiatives and policies regarding the improvement of their operations:

1. Grow and develop an environment of “openness”, with knowledge clusters, co-operation and, generally, collaboration between them, probably in the form of innovation networks, even with competitors.

2. Collaborate continuously with academic – research institutions on the grounds of research activity and staff training, as well as with bodies – networks which support entrepreneurship. Besides expand and manage effectively all sources of information regarding innovation, either internal or external.

3. Plan, in the long run rather than occasionally, the development of new products and improved procedures and develop the concept of continuous improvement.

4. Invest material and human resources in research & development and in peak technologies, e.g., ICT, biotechnology etc.

5. Prepare the conditions to access and exploit the funding opportunities vis-à-vis innovation activities.

6. Study, recognize and finally eliminate the (cost, labor, resources, knowledge etc) factors that stall innovation progress.

Closing, it should be mentioned that the results and the conclusions of the presented
project have been exploited in order to start the Innovation Pole of Crete, which in the future can be turned into a knowledge cluster. In this Pole, the following participate: the University of Crete, the School of Engineering of Crete, the Technological Education Institute of Crete, the Forth, the Science and Technology Park of Crete, the National Agricultural Research Foundation, Chambers, companies, local, regional and public actors.

The Innovation Pole of Crete focuses its actions into the scientific and technological areas of a) Information Technologies, b) Biotechnologies and c) Medical Technologies, which constitute areas where Crete presents a competitive advantage, mainly due to the excellent performance of its scientific community. The Innovation Pole of Crete is the first real regional innovation network with concrete expected results and, as mentioned previously, this could be considered as the major output of the recently realized innovation programs in Crete.

References


Table 1: Innovativeness of companies in Greece per Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent of innovating firms</th>
<th>Percent of innovating manufacturing firms</th>
<th>Percent of innovating firms in services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrace – East Macedonia</td>
<td>15.1</td>
<td>14.7</td>
<td>33.2</td>
</tr>
<tr>
<td>Central Macedonia</td>
<td>23.0</td>
<td>22.1</td>
<td>30.8</td>
</tr>
<tr>
<td>Western Macedonia</td>
<td>25.5</td>
<td>27.1</td>
<td>-</td>
</tr>
<tr>
<td>Epirus</td>
<td>27.5</td>
<td>28.7</td>
<td>7.9</td>
</tr>
<tr>
<td>Thessaly</td>
<td>4.2</td>
<td>4.4</td>
<td>-</td>
</tr>
<tr>
<td>Ionian Islands</td>
<td>5.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Western Greece</td>
<td>25.1</td>
<td>19.2</td>
<td>58.4</td>
</tr>
<tr>
<td>Sterea Ellada</td>
<td>36.0</td>
<td>35.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Peloponnese</td>
<td>21.3</td>
<td>23.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Attica</td>
<td>30.9</td>
<td>30.3</td>
<td>33.3</td>
</tr>
<tr>
<td>Northern Aegean</td>
<td>17.8</td>
<td>18.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Southern Aegean</td>
<td>14.7</td>
<td>11.9</td>
<td>34.1</td>
</tr>
<tr>
<td>Crete</td>
<td>23.1</td>
<td>28.4</td>
<td>2.6</td>
</tr>
</tbody>
</table>
**Table 2:** Statistical population of companies and selected sample of the telephone research

<table>
<thead>
<tr>
<th>Sector</th>
<th>Statistical population</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of companies</td>
<td>Percentage</td>
</tr>
<tr>
<td>Food and Beverage</td>
<td>548</td>
<td>10.27%</td>
</tr>
<tr>
<td>Trade</td>
<td>4,687</td>
<td>87.85%</td>
</tr>
<tr>
<td>New forms of Tourism</td>
<td>55</td>
<td>1.03%</td>
</tr>
<tr>
<td>Primary Sector Products</td>
<td>45</td>
<td>0.84%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,335</strong></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1: Members of the Cretan innovation network

- **COMPANIES**
  - (R & D DEPARTMENTS)
  - PRIMARY, SECONDARY, TERTIARY SECTOR (TOURISM, AGRO-PRODUCTS, TRADE, SERVICES ETC.)

- **TECHNOLOGY TRANSFER AND INNOVATION SUPPORT CENTRES**
  - SCIENCE AND TECHNOLOGY PARK OF CRETE, CENTRE OF ENTREPRENEURIAL AND TECHNOLOGICAL DEVELOPMENT, PRAXIS NETWORK, CHAMBERS, YOUTH ENTREPRENEURSHIP, DEVELOPMENT AGENCIES ETC.

- **RESEARCH AND TECHNOLOGICAL INSTITUTIONS**
  - FORTH, HELLENIC CENTRE FOR MARINE RESEARCH, NATIONAL AGRICULTURAL RESEARCH FOUNDATION, MEDITERRANEAN AGRONOMIC INSTITUTE OF CHANIA

- **ACADEMIC INSTITUTIONS**
  - UNIVERSITY OF CRETE, ENGINEERING SCHOOL OF CRETE, TECHNOLOGICAL EDUCATION INSTITUTE OF CRETE

- **FUNDING**
  - EU PROGRAMS, NATIONAL FUNDING, BANKS, VENTURE CAPITAL ETC.

- **REGIONAL PUBLIC ORGANIZATIONS**
  - REGION OF CRETE, LOCAL AUTHORITIES, OTHERS

- **FUNDING**
  - EU PROGRAMS, NATIONAL FUNDING, BANKS, VENTURE CAPITAL ETC.

- **REGIONAL PUBLIC ORGANIZATIONS**
  - REGION OF CRETE, LOCAL AUTHORITIES, OTHERS
Figure 2: Percentage distribution of companies vis-à-vis the year of their foundation
Figure 3: Percentage distribution of companies vis-à-vis the number of their employees
Figure 4: Percentage distribution of companies vis-à-vis the percentage of higher-education graduates employed there
Figure 5: Percentage distribution of certified companies vis-à-vis their QMS

- ISO (9001, 9002 etc.): 52.59%
- HACCP: 29.31%
- ISO & HACCP: 17.24%
- ISO, HACCP & IFS*: 0.86%

* International Food Standard
Figure 6: Percentage geographical distribution of companies vis-à-vis their target markets