AN ARGENTINEAN INNOVATION AND TECHNOLOGY MANAGEMENT SPECIALIZATION PROGRAMME: THE GTEC CASE STUDY

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De Boeck Supérieur | « Journal of Innovation Economics & Management »

2014/1 n°13 | pages 163 à 173

Article disponible en ligne à l'adresse :


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SCENARIO ANALYSIS

Using commonly accepted methodology employed for industrialized countries, a study was made in Argentina’s western region to compare local performance in innovation vs. UE. There are several papers and works that reflect the main stream of innovation in Argentina and this material demonstrates the way of thinking that this country uses to improve its performance. The fact that innovation is a key element in firms’ performance is well established in developed countries. A comparison based on the European Community Innovation Surveys (CIS), among other sources, has been made to establish which practices and lectures have been used to achieve success in UE and discover whether these “practices and lectures” are part of the agenda in innovation programmes or innovator training in the Argentine middle western region. The aim is to find out more accurately, which factors are influencing the innovation process and measure the impact that some ideas and lectures on innovation have on performance; especially for innovator managers in the SME sector.
As a starting point the authors have used two working papers:

A) (Unidas 2013a) (Unidas 2013b) which explains the history of Argentina’s national innovation effort from 1992 to 2002 and B) (Chudnovsky, López, Pupato 2006) the historical perspective.

Finally, it should be noted that an additional statistics study was needed to develop this work which covers the evolution of some measurements from 2006 to 2012. This study has been only validated for the Middle Western region of Argentina.

Based on the situation described in the abstract and the special implications that this topic has for the western region of Argentina, a team of teachers from the GTec Specialization Programme (Di Bello, Versino, 2013) has developed a research initiative. The objective is to find out which part of the training programme has the highest probability of changing the poor performance that SMEs located in the region have shown.

To work in this way two student samples were created. The first one (called group “A”) was selected from graduates between 2000 to 2005, all the students (35 to 50 years old) are working on innovation and technology management but without formal training in innovation or technology management (self-made managers). All of them were born in Argentina’s middle west and are currently working in Buenos Aires or other countries in the world. All of them are well-known, world class actors or referents, and are mentoring the people from group B.

The second sample contains graduates (25 to 30 years old) between 2010 and 2011 that have finished the GTec specialization programme and are currently working but not necessarily working in technology management. This second group, called “B”, was created from a random sample of 10 out of 50 students that are currently working to implement projects where they hope to obtain a patent or develop an innovative product or service for a cluster of small companies in the Mendoza region in western Argentina (Promissory local referent).

One of the most interesting answers from the graduates in group “A” was that they think that the teachers at the University do not have satisfactory experience in the SME field and that many of the most prestigious teachers work (or have worked) for large companies. This relationship between “large company” / “professional prestige” / “successful innovation possibilities” was a paradigm that was very hard to remove from the students’ and graduates’ minds in groups A and B. We will refer to this fact as the “fallacious paradigm” from here onwards.

The faculty teachers made a careful analysis and selection of the most relevant students from the present specialization programme (group “B”).
Then, with the help of interviews, the graduates’ expectations and experiences of professional life (in the field of innovation and technology management) were compared with selected successful real-life cases (group “A”).

From among the selected readings by the authors (Palma, Masera, Calcagno, 2012), special care has been taken to present the case materials indirectly to the student. This was done by suggested links to the websites of multilateral trade organizations, NGOs, and other SMEs websites in developing countries. These suggested links were introduced to the students using social networks with the help of graduates from group “A”. These professionals agreed to help develop the experiment to try and improve innovation in their own home cities.

The strategy presented above allows us to “see” how the students from group B incorporate concepts that appear in cases in other countries. Furthermore, it helps them to confront local and regional problems. At the same time, it shows us how the “fallacious paradigm” of group “A” was slowly removed from group “B”.

The role performed by the teachers, who are responsible for the final work (thesis), began from the second year of the specialization programme and was spread over more than ten short meetings in which students showed their progress until the end of the course. The experience demonstrated in these texts and cases, shows the degree of proprietorship that students have over the knowledge described in the text. The main measurement used in this step was established on how easy or difficult it was for the student to find the thesis topic and establish a certain possibility of implementing the innovation in a local environment.

Table 1 – Subject of training and activity of the students from group “B”

<table>
<thead>
<tr>
<th>Student</th>
<th>Formation</th>
<th>Main present activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction Engineer</td>
<td>Buildings Structure - Teacher</td>
</tr>
<tr>
<td>2</td>
<td>Economic Science</td>
<td>Credit Risk Management (bank)</td>
</tr>
<tr>
<td>3</td>
<td>Psychology</td>
<td>Human Resources (steel company)</td>
</tr>
<tr>
<td>5</td>
<td>Business Administration</td>
<td>AgriFood - Quality</td>
</tr>
<tr>
<td>6</td>
<td>Industrial Engineer</td>
<td>UVT - University</td>
</tr>
<tr>
<td>7</td>
<td>Electronic Engineer</td>
<td>UVT - University</td>
</tr>
<tr>
<td>8</td>
<td>Mechanics Engineer</td>
<td>Technical Linkage Office</td>
</tr>
<tr>
<td>9</td>
<td>National Public Accontatn</td>
<td>SME owner (family) - Teacher</td>
</tr>
<tr>
<td>10</td>
<td>Electrical Engineer</td>
<td>Smart Greed Implementor (energy)</td>
</tr>
</tbody>
</table>
Learning Sequence Cases

A review was conducted in order to choose the sequence of topics and concepts to be explained in class. This review included the most important subjects that companies (small and large) have recommended that the university uses. Special attention was paid to the recommendation from the companies where group “A” graduates work. Also a list of subjects, cases and reading material was collected from other universities in Argentina (cases that are still used today). We can see a growing interest in the study of local economies and the different elements involved in their development and other topics related to the global economic crisis. While most of the suggested reading leads us back to the early contributions of Alfred Marshall (Marshall, 1996) and (Ostrom, 1990), at the beginning and middle of the twentieth century, those subjects began to be systematically investigated and were linked to the 1970-75 consequences. This particular point of view led the students’ surveys. Note a lack of interest of the students for this historical period. However, from the authors’ point of view, this period has many successes and failures that show us “what we should do and what we should NOT do” in the present economic crisis.

Finally, during a class discussion, the need to examine the region’s history in order to understand the pattern of evolution and the regional roots of sustainable development was identified by the students.

We then continued with the review of pioneering works (the basis of modern territorial innovation systems). We highly recommend some works which were summarized by authors who have analyzed the success of several paradigms belonging to the “Third Italy” (Tabuenca, Levitsky, Mikkelsen, 2001, p. 62). Several studies on local development experiences were replicated, trying to analyze, identify and distinguish factors that contributed to the development of better and sustainable innovation. Finally, we concluded with more recent and international cases like the analysis covering other parts of the developed world and often including cases in developing countries For instance, the experiences of Silicon Valley and Route 128, in the U.S. (Saxenian, 2002) and the Ruhr Valley or Baaden Wurtenberg (Hassink, 1993), in Germany, and Valencia and the Basque Country, in Spain. Another example is the Italian Industrial Districts transfer of parts of the software industry to Bangalore and finally the current cluster of innovation networks in the region of Lorraine in France, (Rodriguez, Boly, Camargo, 2012; Boly, 2008), to name just a few.

All this tends to suggest that “there is something in the local matters” that may be important for development. Nevertheless, it is not always evident. The construction of these frameworks was based on the need to build mental
models that are shared by the student groups and the shareholders (SMEs), who promote the need to connect students to a context rather than to texts.

At this point in the training, the group “B” students were taught how to identify “the something in the local ...” and to devise some practical means of exploiting it in the SME clusters and translate it to stakeholders and shareholders. The most obvious outcome of the mission is the results, in terms of growth, job creation, technological innovation and social welfare. Which are not predictions of a theoretical group, but observable realities in various parts of the world and usually lead us to sustainable and successful development in the regional context. Once this stage was finished, students were asked about the importance and impact that the suggested reading, authors and lines of thinking as well as their own work on innovation in the classroom, would have on the region (see table 2).

### Table 2 – Relative importance of the working contexts of the case studies analyzed in the initial classes

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfred Marshall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>10,00%</td>
</tr>
<tr>
<td>La tercera Italia</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>80,00%</td>
</tr>
<tr>
<td>Silicon Valley</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>40,00%</td>
</tr>
<tr>
<td>Valle del Ruhr</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>50,00%</td>
</tr>
<tr>
<td>Lorraine Innovation</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>60,00%</td>
</tr>
<tr>
<td>Bangalore</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>30,00%</td>
</tr>
</tbody>
</table>

### Figure 1 – Relative importance (usefulness) of the cases seen as application examples for students’ jobs.
As a result of this first part of the training process, none of the students could identify the subject or theme of their final work. They were still thinking about the ease of innovating in other countries and could not see how to use all their acquired knowledge to help certain local businesses or clusters.

**CHANGES IN THE SECOND STAGE OF TRAINING**

As a consequence, the second stage of the training was related more to the review of existing financial and tax reduction instruments and cases implemented in the country by large companies. Unlike during the first stage, here the students had closer contact with people from small businesses and a greater knowledge of local problems and constraints.

The themes for this second part include topics covered in the following literature. But the students were instructed to speak to the SMEs about the subjects and listen to their thoughts about it:

- Schumpeterian economics of innovation and knowledge management. Special business and design (Reinert, Aldcroft, Ross, 2002).
- Innovation management skills to encourage innovation in business (Varela, Bedoya, 2007; Tabuenca, Levitsky, Mikkelsen, 2001; Veciana, 2005).
- Technologies based on strategies generation and development strategies for a technology-based company (Kantis, Angelelli, Gatto, 2000; Varela, Bedoya, 2007).
- Planning, management and evaluation of R + D + I (Research + Development + Innovation) (Jain, Triantis, Weick, 2010; Acs, Audretsch, 2011).
- Protection of intellectual property and monitoring technology (Millan, 2006; Rivera, 2012).
- ICT in the company as a tool for innovation and development (Dutschke, 2011).
- Innovation engineering organization and methodologies for innovating in companies. (Boly, 2011) (* using partial non official translations from French to Spanish)
Project management and software tools for the design, management and control of projects of R + D + I (Maculley, 2008; Govindarajan, Trimble, 2010; Carlson, Wilmot, 2006).

Applied finance development project I+D+I (Veciana, 2005; Christensen, 2010; Ladenheim, 2011).

Table 3 shows the number of contacts and relationships, whether in the form of visits to groups or person to person contact that students could make at this development stage. The increasing number of contacts has helped students to narrow-down the subject for the thesis from pure academic thought to a more real-world one related to the region’s SMEs.

Table 3 – Statistics of number of contacts (people) that each student visits

<table>
<thead>
<tr>
<th>Students (group &quot;B&quot;)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics of innovation and knowledge management</td>
<td>0</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Innovation management skills</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Technologies based on strategies</td>
<td>1</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Planning, management and evaluation of I + D + I</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Protection of intellectual property and modernization technologies</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>ICT in the company as a tool for innovation and development</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Innovation engineering organization and methodologies</td>
<td>1</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Project management and software tools for the design</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Applied finance development project I+D+I</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

**FINAL PEDAGOGIC RESULTS**

In this final picture the number of weeks that each student took to develop the final report is presented. Also a column (transfer) shows whether the student’s thesis resulted in a successful innovation for the company. A transfer of less than 50% must be read as a null or failed innovation initiative.
Table 4 – Data synthesis on the panel

<table>
<thead>
<tr>
<th>Student</th>
<th>Thesis Subject</th>
<th>Weeks</th>
<th>Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advanced technologies applied to construction with adobe</td>
<td>12</td>
<td>80%</td>
</tr>
<tr>
<td>2</td>
<td>Innovation in the timber cluster in Mendoza</td>
<td>2</td>
<td>95%</td>
</tr>
<tr>
<td>3</td>
<td>Psychological Bases for Conflict Mitigation in Critical Strategies</td>
<td>4</td>
<td>60%</td>
</tr>
<tr>
<td>4</td>
<td>Construction of public financial instruments for the region.</td>
<td>3</td>
<td>60%</td>
</tr>
<tr>
<td>5</td>
<td>Financial base to promote and implement capital risk (stake holder virtual platform)</td>
<td>4</td>
<td>25%</td>
</tr>
<tr>
<td>6</td>
<td>Develop of shared Mental Models for the steel supply chain in the region</td>
<td>16</td>
<td>70%</td>
</tr>
<tr>
<td>7</td>
<td>Mapping between ofert (Gtec thesis) and demand (Industry) in Mendoza</td>
<td>16</td>
<td>70%</td>
</tr>
<tr>
<td>8</td>
<td>Financing innovation in milk cluster tecnificación (goat milk)</td>
<td>0</td>
<td>90%</td>
</tr>
<tr>
<td>9</td>
<td>Marketing in innovation for the Economics Science Students</td>
<td>25</td>
<td>10%</td>
</tr>
<tr>
<td>10</td>
<td>Continued funding of innovation and ICT Cluster on Mendoza</td>
<td>1</td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 2 – Correlation of key measurements

Contactos = number of SMEs contacted by students – range 2 to 10
Semanas = Weeks needed to work in the company – range 0 to 25
Transferencia = number of effective successful innovation initiatives (according to company owners) – range 2 to 10

In the main diagonal of the matrix, the average and standard deviation of the samples can be seen. On the remaining cells, correlations among variables and linear interpolation can be seen.
DISCUSSION AND CONCLUSION

There are two cases, students 10 and 8 who demonstrate a behaviour that is more than 3 times removed from the standard deviation of the samples. In the first case, this behaviour is explained by the age and number of contacts (known people). For student 1, the high result obtained with the low number of contacts can be explained by the high need and demand for innovation in the industry (goat’s milk) in which it operates (more than 200 km outside the metropolitan area of influence of the university).

a) The case of student 9 shows a notable difficulty in finding the main topic for her thesis. This may be attributable to focusing efforts on organizing an academic entailment unit that tries to operate with a business cluster and government integration plan. This unit located at the Economics Sciences Faculty, where she works pays special attention to political matters. This work has not been successful (yet) but we think the problem is related to the use of strategies for large companies extrapolated to hundreds of micro and small businesses.

b) It is possible to infer a good negative correlation between the number of contacts made and the effective time to establish the main hypothesis and the first draft of the thesis. Also there is a good correlation between the number of contacts and the possibility of effective and efficient transfer.

It must also be stated that only 10 out of 50 students have completed the GTec specialization programme. Many of the students that have not finished the programme were enrolled to work in the innovation outside of the region of Mendoza. They are working in innovation or technology management for soya bean and oil companies that have a high demand for people to work in this field.

The 10 students that have finished the specialization programme have disproved the paradigm that says “Innovation is only possible in a LARGE or international company”. At the beginning of the course, they believed that the opinion of the teachers was less important than the opinion of group A members. They also thought that the international crisis was an obstacle to any innovation initiative. However, by the end of the course they are convinced that it is possible to build a regional development system using a mix of private public framework involving a cluster. They think that the international economic crisis is an opportunity to create innovation everywhere. They also believe that the approach of Elinor Ostrom on economic governance and common pool resources is a promising way to escape the economic crisis.
Last but not least, we think that the help and experience of graduates from group “A” was decisive in fostering awareness of possibility that innovation holds for local development and the opportunities that it provides for a professional and personal career.

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