

## **Leadership as Social Competence in PhDs in Relation to Professional Achievement: Three Empirical Investigations**

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Leadership assessment is analysed in 3 investigations: a) a quantitative study carried out with scientists (R&D), where a distinction between chief/leaders (units' director or chief) and subordinate members in academic units of research was made; b) 2 qualitative studies also carried out at the third-level: the first one with PhDs from 4 National University of Cuyo Schools and the second one with PhDs/ PhD students from Argentina and other countries who participated in internationalization programmes in France. The latter is based on the hypothesis that the highest level of education achieved, added to the immersion in another culture after having undergone a national process of selection before the mobility programme, could result in a greater valuation of the of the so-called social and management competencies, which, according to the OECD, are nowadays essential. Assessment was observed through different techniques. Study 1: the core variables were Mobility, Product, and Professional Satisfaction in relation to Leadership. Two questionnaires were used, and indexes and 7 grids were created. Studies 2 and 3 (qualitative): the hierarchical evocations technique was used to capture the "meaning" underlying behaviours. Results: a) the only constant variable in the group of scientists ("soft sciences" and "hard sciences") was the negative evaluation of their bosses. b) In the groups made up by PhDs who were not scientists, leadership as such does not emerge, although a certain degree of relevance is given to the psychosocial/relational competencies as a factor of Professional Achievement, Mobility and Satisfaction.

*Keywords:* leadership, scientists, PhDs/PhD students, competencies, professional mobility, satisfaction at work

### **Introduction**

The three researches that we will analyse include populations made up by third-level (PhD students and PhDs) and involve competencies, particularly psychosocial ones, among them Leadership. However, there are particular aspects that define the respective theoretical frameworks. It should be also pointed out that in the 3 studies mentioned above one variable was central: Professional Mobility. Among the scientists (chiefs and members), this variable was measured by the promotion in the hierarchy of the scientific system. Among the PhDs (many of them professors at the University of Cuyo), holding posts with different academic ranks (Instructor, Assistant, Associate, and Professor, both acting and tenured by competition), such ranks were taken into account (cf. Aparicio, 2014). In other words, the qualitative evaluation or Satisfaction

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with the leader, is carried out in relation to the Mobility observed.

Taking this into account, we make a presentation offering, first, the quantitative research, carried out within the strictly scientific field (hereinafter, 1. R&D, Research & Development Units) and the 2 qualitative investigations (hereinafter, 2. PICTO: Research Projects, Science and Technology Oriented and 3. IAM: International Academic Mobility).

## Literature Review

### 1) R&D Research

Researchers have been exploring for elements that determine organisational success, including scientific ones, for decades. However, the role of the leader in academic units of research and management of scientific organisations are topics about which not much literature has been written, and most of which refer to academic organisations. Other studies concentrate on issues such as power, dedication, commitment, satisfaction at work, work atmosphere, etc. It is generally assumed that “good leadership results in ‘higher workers’ morale, and this, in turn, in an increased effort which eventually leads to higher productivity in the organisations”. International literature on factors which affect organisational work and group productivity is abundant, but its results are somehow controversial (Perrow, 1968).

In Argentina, Aparicio has been analysing the issue of leadership in relation to satisfaction, productivity, human resources and external resources as well as its relationship to professional mobility, since 2002. This aspect is especially relevant in present-day Argentina, since the structural barriers imposed by the system could become a source of conflict and generate psychosocial patterns which may affect academic-scientific organisations internally (Argentina, 1996; Aparicio, 2007<sup>a</sup> and b; 2014; 2015 b; 2022 b).

In this present study, our referent will be the important research done by the UNESCO, recognised as “International Comparative Study in Organizations and Performance of Research Units” (1971-1989).

From the analysis of the correlations between the main variables found – Satisfaction, Professional Mobility, Productivity –, after the construction of indexes and 7 grids, it emerges that some psychosocial factors are related to effectiveness, as well as a social-psychological factor and with professional mobility (Bennis, 1959; Payne, 1958; Etzioni, 1961, 1965; House & Wigdor, 1965; Cole & Cole, 1967; Burke, 1965; Andrews et al, 1979; Hollander, 1975; Stolke-Heiskanen, 1979; Rossel, 1970; Greene, 1975; Argyris, 1975; Peltz & Andrews, 1976; Dessler & Valenzi, 1977; Eden & Shani, 1982; Fiedler, Novak & Sommerkamp, 1982; Kwiek, 2018; Li, Yin, Fortunato & Wang, 2020).

Regarding Leadership in scientific organisations, we recovered the studies of the “founding fathers”, among them: Meltzer, 1965; Payne, 1958; Bennis, 1959; Burke 65; Fiedler, 1967, 1982; Rossel, 1970; Crowe, Bochner & Clark, 1972; Argirys, 1975; Greene, 1975; Hollander, 1975; Dansereau, Graen & Haga, 1975; Meyer, 1976; Mehra,

Smith, Dixon & Robertson, 1976; Dessler & Valenzi, 1977; Knorr, Mittermeir, Aichholzer & Waller, 1979; Eden & Shany, 1982; King, 1990; Spillane, 2005; García Carreño, 2021.

The Nomenclature of Science and Technology Fields (UNESCO, 1971-1989) was used in the present study. The “disciplinary homogenization” (system of beliefs, values and assessments associated with socialization and traditions) differs according to the disciplinary field to which it belongs, “hard” or “soft” sciences. This will lead to a different level of satisfaction regarding the different psychosocial factors at stake in the grids created: Merton, 1968; Crane, 1972; Bourdieu, 1972; Gaston, 1972 (“invisible college”). See Argentina, 1996. Also Aparicio, 2002, 2005, 2007 a and b, 2014, 2015 a and b, 2022.

In this article, we will analyse the role of leaders in scientific organisations and the level of acceptance/valuation by team members – both in “soft sciences” and “hard sciences” – in relation to Professional Mobility and Satisfaction.

## **2 and 3) PICTO – IAM (Oriented Scientific-Technological Innovation Programme - International Academic Mobility)**

Let us consider the global stage for a moment. On it, new psychosocial and management competencies have become essential for decision-making and for managing change and human resources management in the face of uncertainty. This is linked, moreover, to geographical and professional mobility related to the Internationalization of Higher Education, which began with the Bologna process. Indeed, in 1998, representatives of the governments of Germany, France, Italy and the United Kingdom signed the Sorbonne Declaration. It was then when the need to create a common space for higher education, which encouraged mobility and students’ exchange programmes, became evident. In 1999, with the signing of the Bologna Declaration, the creation of the European Higher Education Area (EHEA) was formalized. The constitution of a flexible university system was agreed to in order to facilitate greater possibilities of training and employment, through the recognition of degrees obtained in other countries.

In our particular case, the Alfa Tuning Latin America Project (2004-2007 and 2011-2013) also had a great influence; a high-impact project generated by European universities to respond to the challenge set out in the Bologna Declaration and the Prague Communiqué. Through inter-university collaboration, a certain homogeneity between the education provided by the European and the Latin American universities was sought to be achieved. The aim was that students and graduates would accomplish greater competitiveness in their working lives, on the basis of their training in developing generic and specific competencies.

It is not our purpose to deal here with the Bologna process, its evolution and consequences; nor about the Tuning Latin America Project. One of the meanings given by the Merriam-Webster Dictionary assigned to the English verb “to tune” is to consider: a) generic competencies or abilities that every subject needs to implement in order to effectively resolve personal and professional life situations, being common to any university degree (ability to learn, to solve problems, to make decisions, interpersonal skills); b) specific competencies of each thematic area (for an analysis

of the 27 generic and specific competencies, their descriptors and indicators, cf. Beneitone, 2007; Glavinich, Aparicio, Duarte et al, 2020).

Nor will we deal with the different approaches to competencies or on the ups and downs that their formation has undergone since the 1980s, since there is a vast literature (Bologna Declaration, 1999; Delors Report, 1996; UNESCO Declaration, 2009, OECD (2018<sup>a</sup>, b, c, d), Lévy-Leboyer, 2003; Le Boterf, 2001. Instead, we will follow Perrenoud (1999, 2008) and, particularly, Kallioinen (2010) as their conceptions were framed within the context of creation of the European Higher Education Area. The Tuning Project (2007), where the competencies are linked to a quality higher education that provides students with relevant learning for their working life, is also recovered. The development of core competencies does not imply the mere acquisition of knowledge, but rather its operational use in cultural spaces, social interaction and professional development, that is, the development of capacities for the creation of new knowledge. In this sense, competencies are understood here, and in a generic way, as a wide range of knowledge, skills and aptitudes that illustrate a person's ability to develop their professional tasks. That is, they show the ability to solve cognitive, practical, personal and social problems within a specialized area of work or study (Kallioinen, 2010. Also see Roegiers, 2008; Palmer, Montaña & Palou, 2009; González & Wangenaar, 2003; Villa & Poblete, 2011; Sánchez-Elvira, López-González & Fernández Sánchez, 2010; Bingimlas & Hanrahan, 2010; Boekaerts & Cascallar, 2006; Blanco, 2009; Alonso, Fernández & Nyssen, 2009; Attali, Brandys, Charpak, Feneuille, Kahn, Kristeva & Touraine, 1998; Villarroel & Bruna, 2014; Alexander, Escudero Nahón & García Ramírez, 2017; Magaña Medina, 2022, PISA 2015, OECD 2016 a and b; 2017 a and b; 2018 UNESCO, OECD; Henseke & Green, 2016; Martin, 2018; Boix Mansilla & Gardner, 2007; Boix Mansilla, 2016; Bringle & Clayton, 2016; Jimeno, Lacuesta, Martínez, Villanueva, 2016).

Rather, we are interested in knowing something more about the competencies actually formed in Latin American countries and in Argentina; particularly, non-disciplinary ones (knowing how to know); the formation of action knowledge (Shön, 1983, 1992; Argirys, 1982,...), procedural knowledge (knowing how to do), knowledge to live together (knowing how to be), social competencies and meta-competencies for management. Among the latter, in the international literature, the role of leadership stands out.

Our objective is to know if this psychosocial competency is recognized and valued by those who have reached the highest level of education (Doctorate degree) as well as to observe to what extent it is linked to personal development (in this case, to Satisfaction and Mobility in the hierarchical scale), and also organizational and national (innovation).

In this sense, in Argentina, Aparicio has been investigating the problem since the 2000s (cf. Publications/production, link CONICET). Many of her research works concern social competencies and the quality of both the university and scientific-technological systems, focusing on different variables/indicators). In particular in the last decade (2016-2021), she has conducted two (2) qualitative investigations with doctors from UNCUYO (PICTO), PhDs and PhD Students to which we refer in the second part of this article (PICTO and IAM). The findings resulting from the fact that a similar methodology and techniques that incorporate common items have

been used—allow us to make inter and intra comparisons between the respective populations/samples and observe convergences and divergences; in the case at hand, in terms of training and/or assessment of what Aparicio calls “social and management competencies” and, in particular, the role of Leadership.

The findings – due to having used a similar methodology and techniques that incorporate common items – allow inter and intra comparisons between the respective populations/samples and observe convergences and divergences; in the case at hand, in terms of education training and/or assessment of what Aparicio calls “social and management competencies” and, in particular, in the role of Leadership. These investigations were:

2. A study was carried out in Argentina with three (3) actors from the National University of Cuyo –, scientists, professors and administrative/academic support staff – in order to observe the strengths and weaknesses of the system according to the shared representations regarding the competencies, and which were developed or “lacking” in those who had gone to University. The objective was to implement continuous improvement programmes (PICTO - Oriented Scientific-Technological Innovation Programme). In this article we focus on doctors.

3. To complement the previous study, another research was carried out in Europe with Argentine and foreign PhD graduates who participated in Internationalization and bilateral Cooperation programmes. The hypothesis considered is that the highest level of education achieved, added to the immersion in another culture after having undergone a process of selection, where competencies other than disciplinary were assessed, could show a higher level of development of some psychosocial competencies (IAM - International Academic Mobility), Aparicio, 2019, 2020 a, b).

Moreover, Mobility has been Aparicio’s object of study since the 1980s (cf. especially, link CONICET; 2016-2022; 2022 a; 2022 b).

First, she addressed intergenerational mobility (the first research work in the world with 3 real generations along the same line: home survey on graduates, parents and grandparents, 1,129 family groups). Then, since the 1990s – in the light of increasing globalization and the structural imbalances that generated the fall in jobs and structural unemployment (particularly in Argentina, in 2001-2002) – she conducted new studies with graduates, dropouts, and delayed students in relation to the established required length (1983 - 2004/2014). Regarding Mobility, career mobility was analysed from the French-Argentine comparative study whose axis is academic-professional trajectories – a term introduced by Aparicio and which has become extended nowadays) – as well as the factors that impact on them. These researches, which involve field monitoring, were carried out with multiple populations: university students, scientists, state personnel, health personnel, decision makers, among others (Aparicio 2005, 2009, 2016).

Globally, since the 2000s, Aparicio began working with cohorts covering more than two decades in two (2) national universities in Argentina: National University of Cuyo (UNCuyo) and the National University of Technology, Mendoza Area, (FRM, UTN). Her research generates multiple complementary studies in which she analyses, among other aspects, the articulation or gap between Academic Education, and the

Scientific-Technological System and between Education-Work, addressing the factors that influence the achievement/trajectories of PhDs/PhD students and scientists (grassroots, sociocultural, pedagogical-institutional, psychosocial and structural). She also approaches competencies of different kinds, often almost absent, and which are necessary to function in the current world of work (Aparicio, 2003, 2005, 2007a and b, 2015 a and b, and many other articles referring to trajectories: 2012, 2016, 2019, 2020, a and b; 2022 b. cf. Aparicio, link CONICET).

Finally, there is a third aspect addressed between social and management competencies: leadership, since it is considered a very important variable in the face of change. However, we cannot stop here for reasons of brevity. The international literature is abundant in this regard. Let us just say that we have been particularly interested in the concept of Transformational and Transactional Leadership, following the Full Range Leadership Model (hereinafter, FRLM) by Avolio and Bass (2004). Such model, with its potential and critical points, is based on the research developed by Burns (1978), who distinguished, for the first time, between leaders who acted through exchange programmes models, calling them *transactional leaders*, and those whose behaviours seemed to transcend individual egoism, whom he described as *transforming leaders* (De Vries, Roe & Taillieu, 1997; Lievens; Van Geit & Coetsier, 1997; Yulk, 1999; among others). The latter are oriented to strengthen a mutual commitment with their followers and raise their motivation and morale, to work on identifying higher goals and to awaken credibility and enthusiasm in their followers. Transformational leadership includes four dimensions: *Individual Consideration*, *Intellectual Stimulation*, *Inspirational Motivation*, and *Idealized Influence*. Other models can be consulted in García Carreño (2021).

## Objectives

### 1) R&D Research

The research work had several objectives (Aparicio, 2014; 2015b, 2022 b). As far as we are concerned here the central objective was to know the valuation of the scientific leader made by members of the different groups from the “soft” and “hard” sciences – with the characteristics which identify and/or homogenize them – in relation to the Professional Mobility known during their trajectories and the Satisfaction achieved.

### 2 and 3) PICTO – IAM

a) To observe the importance that the different groups of PhDs and PhD Students who have experienced professional mobility (whether they are scientists or doctors working in a university environment), give to social and management competencies among the achievement factors that they prioritise when considering professional demands and, in particular, leadership.

b) To know their shared representations regarding the articulation or gap of current university education in relation to labour demands and quick changes.

## **Hypotheses**

### **1) R&D Research**

- a) Within scientific organisations, satisfaction regarding the leader varies according to the disciplinary fields (“soft” and “hard” sciences).
- b) Satisfaction with the leader is not related to Productivity or Professional Mobility in the scientific pyramid (“soft” and “hard” sciences).

### **2 and 3) PICTO – IAM**

PhD and PhDs Students do not sufficiently recognize the role played by non-disciplinary competencies, particularly, leadership, with institutional differences depending on careers and contexts.

### **Research Questions (R&D, PICTO and IAM)**

- a) Are there differences concerning Satisfaction with the leader and associated aspects among the different groups addressed, and depending on disciplinary fields? (R&D, PICTO and IAM)
- b) How strongly does Leadership emerge as a factor associated with academic-professional achievement in groups, and in relation to organisational and national macro innovation? (Gaglio, 2011; Alter, 1999; Alkrich, Latour & Callon, 2006) (PICTO and IAM).

## **Design**

We will not stop on the analysis of all the items/questions incorporated in the respective researches, related to the valuation of leadership by scientists and of the social and management competencies, by doctors and PhD students.

In the R&D research, only methodological aspects and findings on Leadership will be outlined.

Taking our objective into account, in the PICTO and IAM researches, we will show how important leadership and related aspects such as decision-making, problem-solving, adaptation to change, and flexibility are to these groups of PhDs students and doctors. We will use the technique of hierarchical evocations which allows us to capture the extent to which there is awareness of the role that this variable currently has among the above mentioned population who have reached the highest level of education. Their representations also reveal which competencies considered should be strengthened as a priority. It should be noted that both their answers and their “silences” will be analysed, since “silences” as such do not exist: they speak for themselves and tell about ignorance and deficiencies, among other aspects. Not knowing which competencies should be prioritized – according to the experience of the countries that lead the learning ranking – is already worrying at a

time when the “new normal” will require a great capacity of adaptation and decision-making (OECD, 2000, 2016 a and b, 2018).

Specifically, in the latter, we only return to some very representative qualitative item(s) in some of the researches, presenting the Summary Table, the 4-plane or quadrant Figure and the 3D Figure (3 dimensions). In others, for brevity reasons, we will summarize the result and/or recover a figure. In these items the importance given to social and management competencies and, among them, to leadership is observed.

The order of presentation is: R&D, PICTO and IAM.

## **Materials and Methods**

Since it was considered relevant to assess what the actors think and value *in situ*, both quantitative and qualitative methodologies were used, in addition to the quantitative-descriptive part. In the case of qualitative methodologies (PICTO, IAM). As we have pointed out, the focus is on the assessment, not only of generic competencies or “know to know” but, particularly, of those related to “procedural knowledge” and “knowing how to be/live together”: social and management competencies.

Scientific production review on the subject shows the near non-existence of field research with those actors that go beyond the quantitative aspect. Furthermore, it shows only a diagnosis of the situation (emergencies, vacancies), yet not the “meaning” that certain trainings and behaviours acquire in the light of contextual changes, that is, those which have impact on the possibilities of achievement of the subjects, the level of development of their professional trajectories and their opportunities for insertion, permanence and promotion within the labour field) (OECD, PISA 2017 a, b and 2018). For this reason, in these 2 researches, an attempt was made to go beyond the long list of “generic and specific competencies” proposed by Tuning to investigate what, *in the daily reality of the different sample groups and higher education institutions*, were the central concerns, strengths, vacancies, the most valued competencies and the “absent” competencies. These aspects can only be achieved through qualitative methodologies.

## **Sample**

### ***1) R&D Research***

A stratified sample was taken from universities and different disciplines, based on a population of researchers (scientist and professors of the Incentive Program), both from the metropolitan and the Cuyo regions (N=1511). The final sample is N=355 - R&D Units (5% error margin). At this first stage, the research professors were from Universidad Nacional de Cuyo (N= 53 Research Units): one chief or director and members.



## **2) PICTO**

The sample consisted of three (3) actors included in the university system: professors, doctors/scientists, and academic support staff from four (4) UNCuyo Schools: Basic and Natural Sciences, Engineering, Economic Sciences, and Philosophy and Literature. It was not representative because the responses were, in all cases, voluntary and informed consent was required.

## **3) IAM**

The sample is made up of PhD students who have participated in university or business exchange programs, since 2018, in Paris. We worked with different cohorts (2002-2003; 2013-2014 and 2018-2019) (quantitative descriptive level/ percentages). Also, on a qualitative level, in the last period (2018-2019), we worked face-to-face, with some volunteers (20% of the total). This last group included some foreigners who lived there for internal exchanges (“brassage”). Finally, 10 voluntary interviews were then added. This provided other views and perspectives, influenced both by training and contextual imprint.

## **Techniques**

### **1) R&D Research**

Two questionnaires were used. The questionnaire concerning the R&D units was answered only by Chiefs-Directors, who informed about their units (human and financial resources, scientific exchanges, age of the research units’ members, national and foreign income resources/budgets and the scientific product, among others).

The Core Members’ questionnaire provided data and opinions, and referred to the social role of individuals working in the R&D Units, as well as information about working atmosphere, jobs ‘perceptions, and opinions on budgets, resources, services, power and influence, research work organisation, leadership, etc.

If we focus on the Grids, we can say that the answers obtained from the Core Members Survey gave rise to a number of grids and indexes, which were later matched to other variables, among which are Production (as an indicator of efficiency), Satisfaction and Professional Mobility (as an indicator of achievement, especially in the field of science).

7 central Satisfaction grids (Grid L: About the job; Grid N: Satisfaction with chief of research units; Grid O: Planning and organisation of research activities in the unit; Grid I: Responsibility); a Product grid and a Professional Mobility grid were developed (cf. link Conicet, Aparicio, 2014, 2015 b, 2022 b).

### **2 and 3) PICTO – IAM**

The same techniques were applied in the two (2) qualitative investigations. As said before, some common items were maintained when this was relevant to foster inter and intra group comparisons. A semi-structured survey with open sentences

and hierarchical evocations techniques were used. Moreover, an interview with a voluntary group was also carried out. Upon combining the frequency with which some words were named and the order of importance given to them by the respondents, that interview made it possible to observe which representations were a priority (central core) and which were peripheral (Moscovici, 1961; Abric, 20012001 a and 2001 b). From this combination, 4 categories, which already enter the quadrant of the nucleus of representation or priority aspects (P2), emerged; already in the peripheral quadrants (P3, P4 and P1). Here we only focus on the “Social/Relational” category, which includes Leadership.

Next, we chart these 4 quadrants or planes. The items addressed here refer to Leadership and related aspects, seen either as a Strength of the training received, or as a claim towards the training institutions.

Below, we show the 4 quadrants (the abscissa axis corresponds to the frequency of the evoked words and the ordinate axis corresponds to the order of importance of these terms, as supported by the actors) (Figure 1).

Figure 1. Quadrants (Hierarchical Evocation Technique)

P 1 (-+)	P 2 (++)
P 4 (--)	P 3(+)

P2 (++) quadrant: that is the nucleus of the representation and it shows the most frequent and most important categories.

P3 (+-): quadrant where categories of low frequency and high importance are located.

P4 (- -): the least important, which are also the least frequent categories are shown here.

P1 (-+): in the P1 quadrant are the low frequency and high importance categories.

Briefly: the importance that each category has for each group is expressed by the position reached by the emerging categories shown in each quadrant.

**Procedures**

In the 3 researches we worked face to face with the actors. The time for the application was unlimited and, at the same time that the semi-structured survey was answered, opinions were provided. They were complemented with an interview conducted by those who were really interested in continuing with the research. The interviews were recorded and then transcribed. In all 3 studies, informed consent was requested and the material was collected personally.

**Results**

We present the results in the same order: R&D, PICTO and IAM.

## 1) R&D Research

Table 1. Satisfaction Indexes

	Minimum	Maximum	Mean	Deviation
Planning	50.77	100.00	88.7590	10.0119
Atmosphere at Work	44.71	96.47	80.5409	10.5910
Supervision/Boss	2.50	100.00	74.3000	26.2832
Level of Satisfaction with Co-workers	6.67	100.00	63.4234	25.2896
Material Factors	21.54	92.31	61.9982	14.7697
About one's Job	35.00	91.67	61.6858	12.2830
Responsibility	10.00	100.00	58.7059	28.0216

As shown in the grid (Table 1), the highest level of Satisfaction is present in the variables Planning (88.75) and Atmosphere at Work (80.54), while the index for Professional Mobility is among the lowest (53.99). The variables which were central for this research were correlated (cf. Aparicio, 2014). The 8 items in this grid include the level of Satisfaction of the members regarding their chief's competence, his/her personality, his/her qualifications as a leader, his/her support, etc. The index varied between 2.50 and 100.00, with the mean of 74.30 and the standard deviation of 26.28, which indicates a high level of satisfaction.

Briefly: general in satisfaction on the part of the subjects towards their bosses or leaders became a relevant issue of these scientific-academic *sui generis* organizations.

Other results were (Aparicio, 2014, 2022 b): No co-relation was found between mobility and product. It becomes clear that there is a positive significant association between Professional Mobility and the indexes for Satisfaction at work, Responsibility for specific tasks and Planning; and a negative significant association with the Boss/Supervisor (Table 2).

Table 2. Co-relation between Professional Mobility and Indexes of Satisfaction

	Atmosphere at work	About the job	Responsibility	Material Factors	Supervisión	Planning	Satisfaction with co-workers
Mobility Index	.086	.370***	.407***	-.013	-.436***	.276**	.028

\* Significant co-relation 10% (p < 0.10)

\*\* Significant co-relation 5% (p < 0.05)

\*\*\* Significant co-relation 1% (p < 0.01)

Let us now observe the co-relation between Professional Mobility and Satisfaction in "hard" and "soft" Sciences.

**Table 3.** Co-relation between Professional Mobility and Indexes of Satisfaction. “Hard” Sciences

	Atmosphere at work	About the job	Responsibility	Material factors	Supervision	Planning	Satisfaction at work
Mobility Index	.040	.488***	.576***	.011	-.455***	.278	.038

\* (p <0.10)  
 \*\* (p <0.05)  
 \*\*\* (p <0.10)

Considering now hard or soft sciences as variables (Table 3 and Table 4), we observe that, in the context of “hard sciences” (Table 3), Professional Mobility is positively and significantly associated to the indexes for Job (0.48 at 1%) and Responsibility (0.57 at 1%). There is, in addition, a negative significant co-relation with the index for Satisfaction with bosses or directors (-0.45).

**Table 4.** Co-relation between Professional Mobility and Satisfaction Indexes. Social and Human Sciences

	Atmosphere at work	About the job	Responsibility	Material factors	Supervision	Planning	Satisfaction at work
Mobility Index	.122	.233	.180	-.013	-.456**	.354**	.030

\* Significant Co-relation 10% (p <0.10),  
 \*\* Significant Co-relation 5% (p <0.05),  
 \*\*\*Significant Co-relation 1% (p <0.01)

Here, a negative and significant association can only be found in the index for Satisfaction with the Supervision or the unit's leader (-0.456 at 5%), while there is a positive association with Planning (0.354 at 5%). See Table 4.

Analyzing the grid of co-relations (Pearson), we can see that significant associations at 1% and 5% between Professional Mobility and Satisfaction are different in the “hard” and “soft” sciences grid, which implies that each disciplinary group values different aspects of satisfaction.

In other words, the most movable subjects in “hard” sciences find satisfaction in some aspects – typically present in their discipline – which are different from those in “soft” sciences (Crane, 1972; Gaston, 1972).

There is only one aspect in common: researchers from both fields feel they are not satisfied with leadership in their teams.

In other words, there is a low valuation/discontent with the team Director/Chief.

## 2 and 3. PICTO – IAM

Doctors (PICTO and IAM) were asked about the following Nodes/Items among other aspects: a) What competencies do they claim from the University?; b) Strengths of the training provided by their University. They were also asked about: 1. What competencies do companies that recruit “hard sciences” PhDs and PhD Students value most? 2. What competencies are valued as a priority by soft science university companies?; 3. What competencies value the Universities about PhDs and PhD Students inserted in the field of “hard” sciences?; 4. What competencies do universities value about university students trained in the field of “soft” sciences?

Finally, it should be noted that concerning the problem addressed, the following qualitative dimensions were also observed. Among them: Innovation, Creativity, Satisfaction, Influence of Automation and Robotics (positive and negative); Priority changes that would be introduced in the Education System and in the Employment System.

Let us observe now, according to PICTO or IAM research works separately.  
PICTO (UNCuyo PhDs)

Here we recover several items (the item number at the end takes up the item number in the semi-structured survey).

Table 5. Dimensions to which Professional Success is Attributed (Item 47a)

Subjects		26	
Sub-categories		4	
Frequency	Maximun	104	100%
	High	26.00	25%
Importance	Maximun	260	100%
	High	55	21%

Importance	<<Training Dimension>>	<<Economic Dimension>>	<<Cognitive- Procedural Dimension>>	<<Relational- Motivational Dimension>>
1	4.8%	1.0%	4.8%	11.5%
2	2.9%	0,0%	6.7%	10.6%
3	2.9%	1.9%	2.9%	13.5%
4	2.9%	1.9%	3.8%	10.6%
Frequency	14	5	19	48
	13.5%	4.8%	18.3%	46.2%
	Low	Low	Low	High
Importance	38	10	51	120
	15%	4%	20%	46%
	Low	Low	Low	High

Figure 2a. – 4 Planes

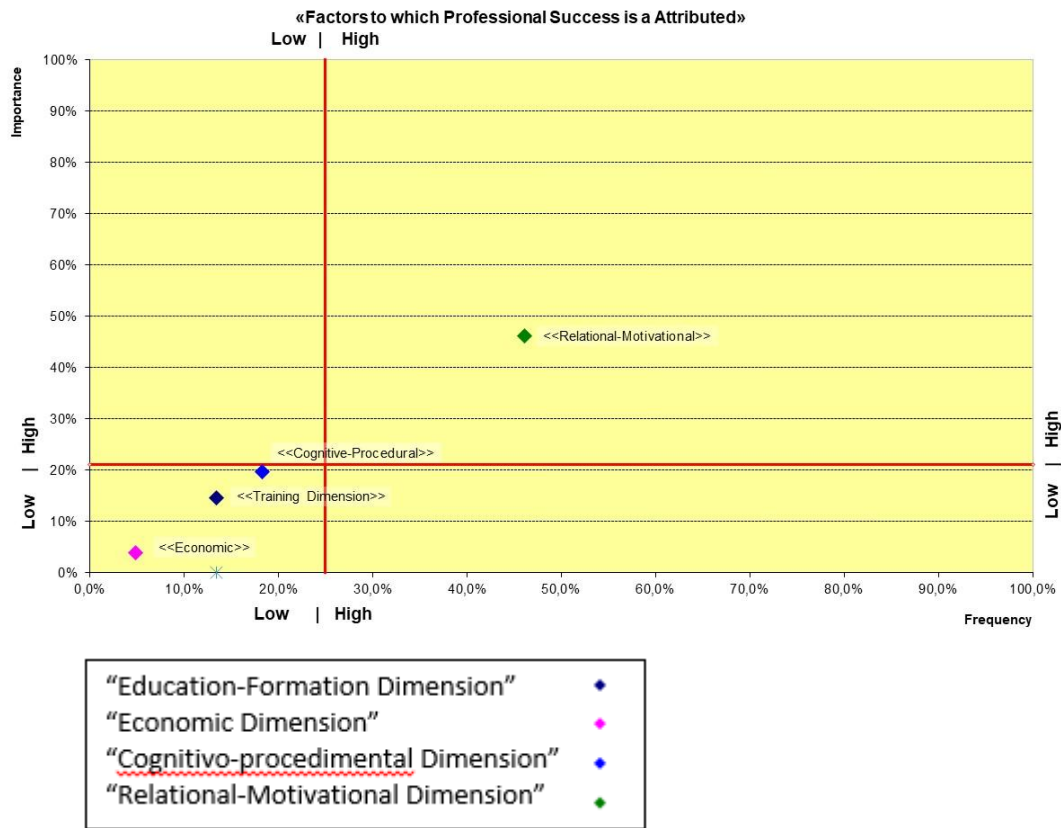
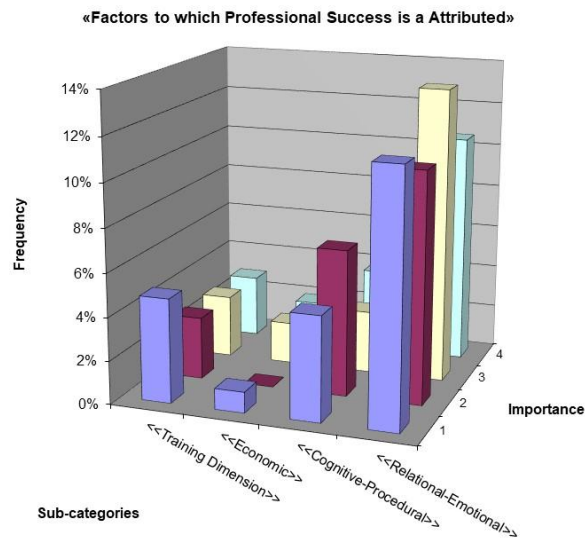


Figure 2b. – 3D (Three Dimensions)



As it can be seen in the Figure above only the Relational-Emotional factor enters the core (P2) of the representation relative to Achievement Factors. It is, by far, the

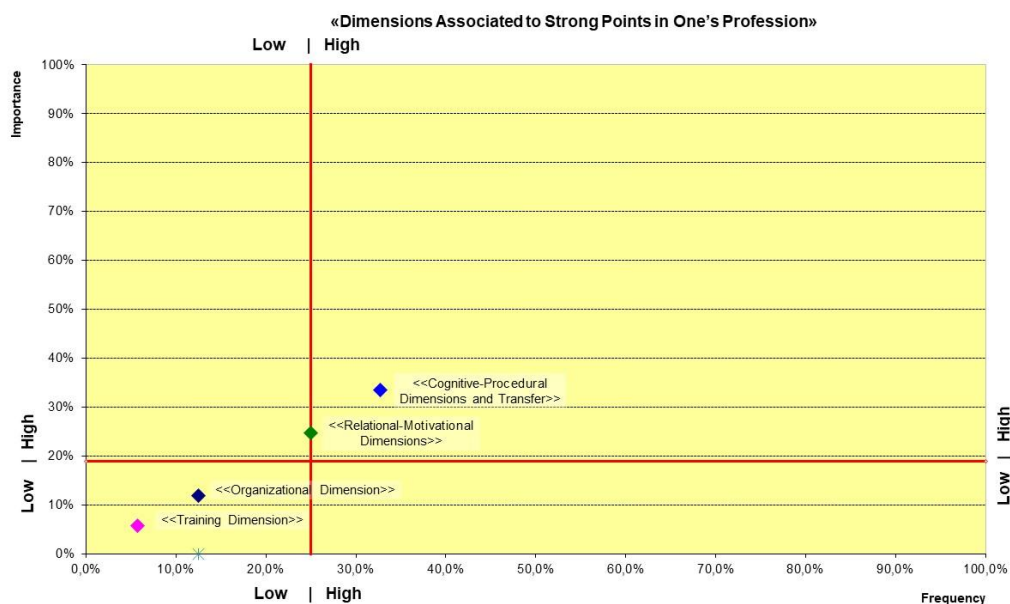
most relevant (hereinafter, FH – Frequency High; 46.2%; IH - Importance High, 46%). However, the term Leadership does not appear. Cf. Table 5, Figure 2 a – 4 Planes; Figure 2 b – 3D (Three dimensions). (cf. PICTO report).

Table 6. Dimensions Associated to Strong Points in One’s Profession (Item 50a)

<b>Subjects</b>		26	
<b>Sub-categories</b>		4	
<b>Frequency</b>	<b>Maximum</b>	104	100%
	<b>High</b>	26.00	25%
<b>Importance</b>	<b>Maximum</b>	260	100%
	<b>High</b>	49	19%

<b>Importance</b>	<b>&lt;&lt;Organizational Dimension&gt;&gt;</b>	<b>&lt;&lt;Training Dimension&gt;&gt;</b>	<b>&lt;&lt;Cognitive- Procedural Dimension and Transference&gt;&gt;</b>	<b>&lt;&lt;Relational- Motivational Dimensions&gt;&gt;</b>
1	2.9%	1.9%	9.6%	3.8%
2	2.9%	1.0%	6.7%	9.6%
3	2.9%	1.0%	8.7%	5.8%
4	3.8%	1.9%	7.7%	5.8%
<b>Frequency</b>	13	6	34	26
	12.5%	5.8%	32.7%	25.0%
	Low	Low	High	High
<b>Importance</b>	31	15	87	64
	12%	6%	33%	25%
	Low	Low	High	High

Figure 3a. – 4 Planes



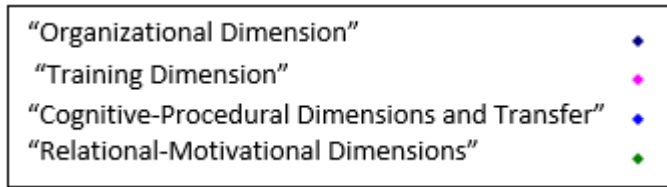
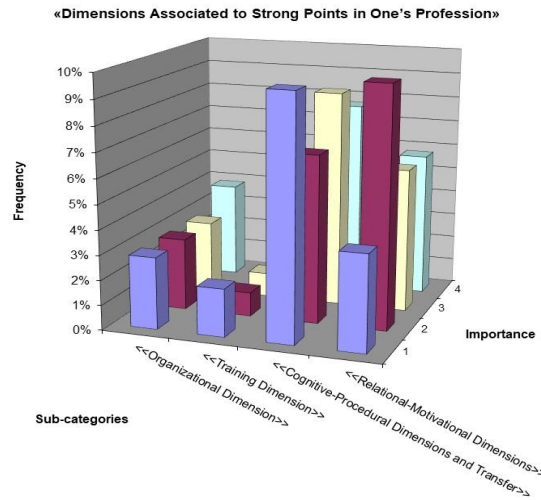


Figure 3b. – 3D



Once again, the Relational-Emotional Dimension (FH, 25%; IH, 25%) enters the nucleus (P2). However, the Cognitive-Procedural and Transference Dimensions, which was also located in P2 (see Figure of 4 planes or quadrants), was much more relevant, as far as we are concerned, the word Leadership was never mentioned (See Table 6, Figure 3a and 3b).

Table 7. Define what Competencies / Values are Required for Leadership (Item 100.3)

<b>Subjects</b>		26	
<b>Sub-categories</b>		4	
<b>Frequency</b>	<b>Maximum</b>	104	100%
	<b>High</b>	26.00	25%
<b>Importance</b>	<b>Maximum</b>	260	100%
	<b>High</b>	49	19%

<b>Importance</b>	<b>&lt;&lt;Training / Competencies and other Factors&gt;&gt;</b>	<b>&lt;&lt;Relational and Management Competencies&gt;&gt;</b>	<b>&lt;&lt;Affective-Competencies&gt;&gt;</b>	<b>&lt;&lt;Cognitive-Procedural Competencies&gt;&gt;</b>
1	3.8%	7.7%	5.8%	1.9%
2	2.9%	9.6%	3.8%	2.9%
3	2.9%	9.6%	2.9%	2.9%
4	0.0%	7.7%	7.7%	2.9%
<b>Frequency</b>	10	36	21	11
	9.6%	34.6%	20.2%	10.6%
	Low	High	Low	Low
<b>Importance</b>	31	90	50	26
	12%	35%	19%	10%
	Low	High	High	Low



Figure 4a. – 4 Planes

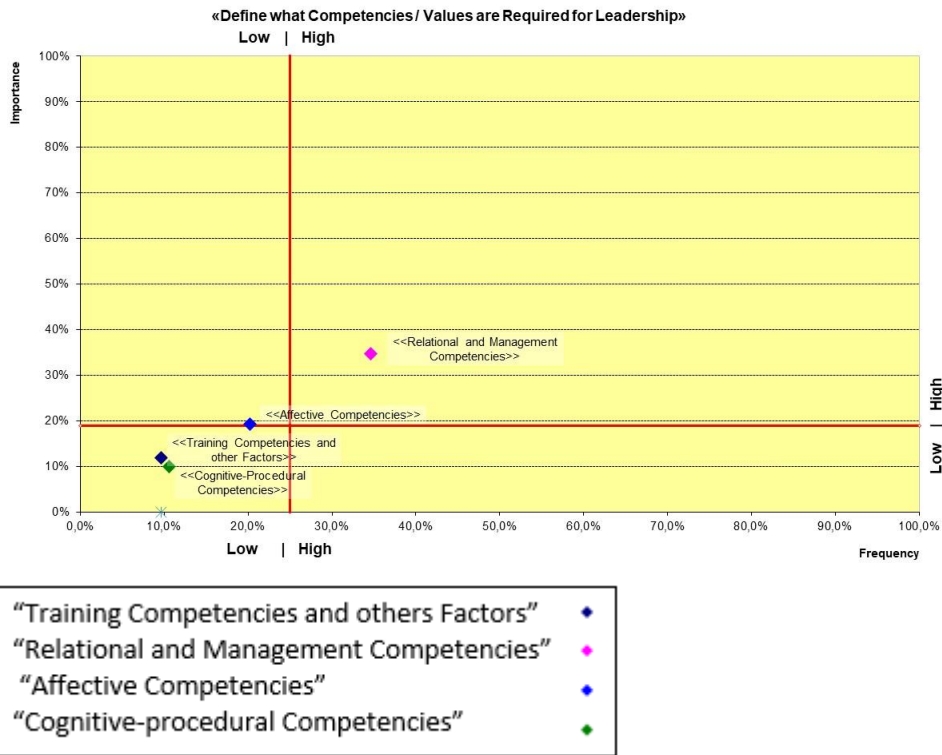
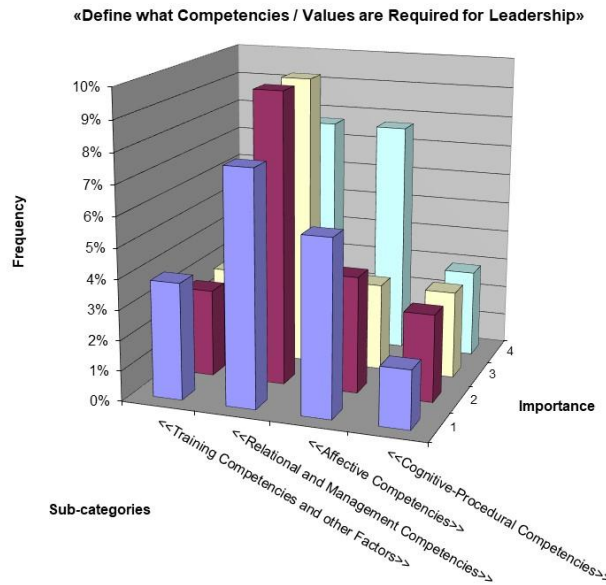


Figure 4b. – 3D



As it can be easily seen, only the category “Relational and Management Competencies” (FH, 34.6%; IH, 35%). enters the core of the representation. The term Leadership as an essential competency currently appears only twice. (See Table 7, Figure 4a and Figure 4b).

### 3. IAM

Table 8. Values of a Person Leading an Organization (Item 38.4)

<b>Subjects</b>		23	
<b>Sub-categories</b>		4	
<b>Frequency</b>	<b>Maximum</b>	92	100%
	<b>High</b>	23.00	25%
<b>Importance</b>	<b>Maximum</b>	230	100%
	<b>High</b>	40	17%

Importance	<<Educational Dimension>>	<<Socio-Cognitive – Management Dimension>>	<<Economic Dimension>>	<<Relational-Motivational Dimension>>
1	33%	4.3%	1.1%	16.3%
2	1.1%	8.7%	0.0%	14.1%
3	4.3%	4.3%	0.0%	12.0%
4	1.1%	4.3%	0.0%	10.9%
<b>Frequency</b>	9	20	1	49
	9.8%	21.7%	1.1%	53.3%
	Low	Low	Low	High
<b>Importance</b>	24	52	4	131
	10%	23%	2%	57%
	Low	Low	Low	High

Figure 5a. – 4 Planes

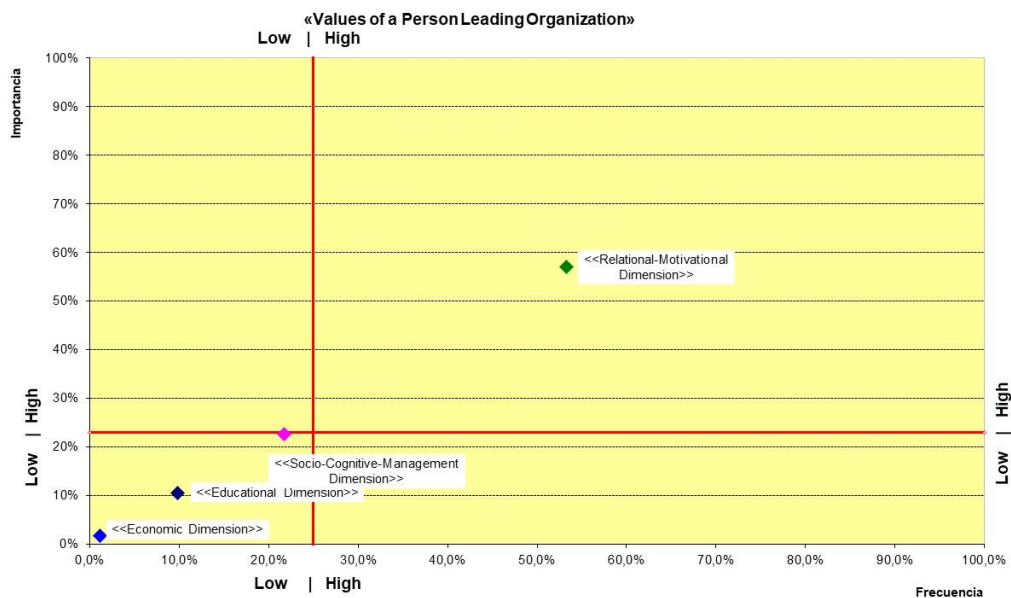
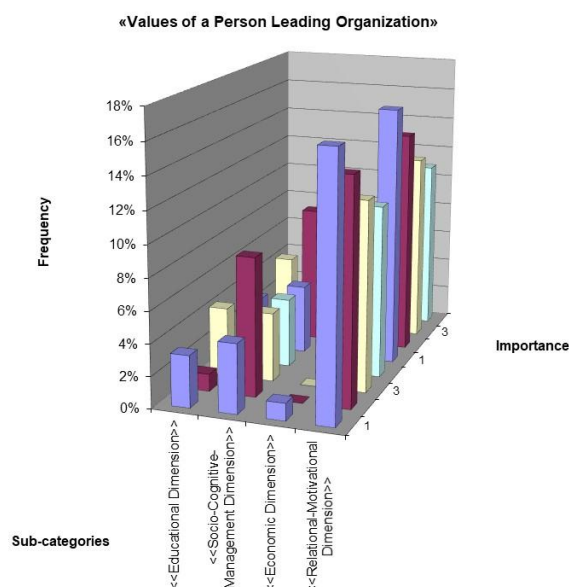


Figure 5b. – 3D



As it can be easily seen, the Relational-Motivational Dimension is the only one that is located in the nucleus; thus being the most significant (FH=53.3%; IH=57%), followed very distantly by the other dimensions located on the periphery. (See Table 8, Figure 5a and Figure 5b).

The subjects who participated in International Exchange Programmes mentioned the Relational-Motivational dimension 49 times in total, followed by the Socio-Cognitive dimension. That is, they recognized its importance regarding employability and their future. They also mentioned different terms related to social and management competencies. However, they did not reach the core of the representation; that is, they were considered secondary.

Indeed, only one (1) subject mentioned the term Leadership. He himself comes from a state-of-the-art university and is an engineer (he is doing a PhD in France). In many other items that respondents were inquired about, the results were along the same line.

Table 9. Competencies to be Developed in Students (Item 500.d)

Subjects		23	
Sub-categories		4	
Frequency	Maximum	92	100%
	High	23.00	25%
Importance	Maximum	230	100%
	High	34	15%

Importance	<<Training Dimension>>	<<Social-Competencies Dimension>>	<< Socio-Cognitive- Procedural Competencies Dimension>>	<<Competencies for Life>>
1	2.2%	4.3%	7.6%	1.1%
2	3.3%	6.5%	5.4%	0.0%
3	2.2%	5.4%	5.4%	1.1%
4	1.1%	7.6%	1.1%	1.1%

Frequency	8	22	18	3
	8.7%	23.9%	19.6%	3.3%
Importance	Low	Low	Low	Low
	22	51	54	7
	10%	22%	23%	3%
	Low	High	High	Low

Figure 6a. – 4 Planes

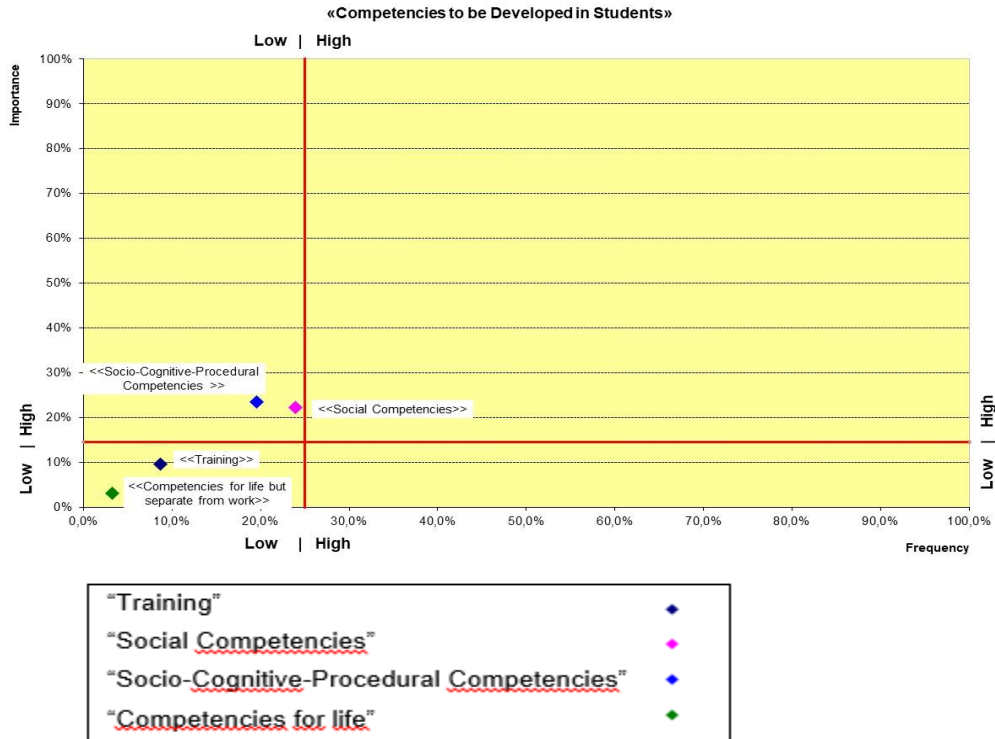
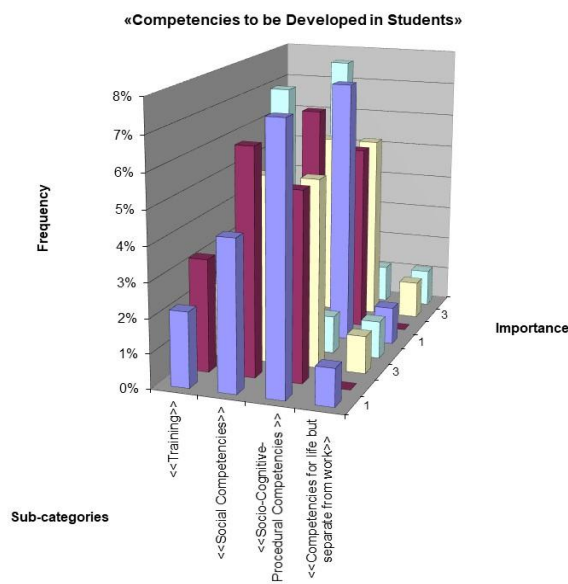


Figure 6b. – 3D



The figures in Table 9 entitled “Competencies to be Developed in Students” exempt from comment: no category entered the nucleus of the representation shared by PhDs and PhD students (IAM). The silences “speak” for themselves. The response rates were very low. In general, they did not know what the term competencies strictly alluded to. Consequently, they could not say which competencies the university system should prioritize in order to respond to the current demands of the world of work. (See Table 9, Figure 6a and 6b).

## Discussion

### 1) R&D Research

The research of which we only address the Leadership variable here-shows, globally, that there are non-linear relationships between psychosocial, grassroots, and organizational variables in the scientific system (bosses/members).

Our results show that – among those who participated in Mobility programmes– the observed levels of Satisfaction with their group leader/chief, are not independent from Professional Mobility or from the associated fields of specializations. a) A significant association exists between Professional Mobility and Satisfaction at work, with no distinction between “hard” and “soft” sciences (disciplinary fields). b) Making a distinction between the two types of sciences, it can be detected that there exists a different association between the factors playing a role in the variables Satisfaction at work and Professional mobility in both “hard” and “soft” sciences. This reveals different professional, disciplinary, and personal identities (cultural homogenization/“invisibles colleges”). c) The only variable on which they agree in “soft” and “hard” sciences is the negative evaluation of the leader, which is our central variable here. In addition, other results are of interest. d) There is no correlation between Production and General Satisfaction. In addition, there are non-linear relationships between Professional Mobility and Satisfaction in relation to psychosocial and organizational factors in scientific groups (bosses/members). That is, those who reached higher levels within the scientific system do not find, within the same system, rewards or incentives related to their professional growth, taking into account the statistics of recent years and the macro-national situation. In other words, the more one achieves and, the higher level one reaches in the hierarchical scale, the more difficult it is to maintain the level achieved in economic terms (international stages, attendance at prestigious international conferences, publication in the best indexed journals of the WOS) and in psychosocial terms, with negative consequences (stress, burnout, demotivation).

Besides, the more the subject develops professionally, the more he/she expects from his Chiefs/Leaders. In this sense, what would be observed is a fall in Expectations. In other words, for the members of the team, the leaders lead little: lack of interest, apathy, lower relative production are evident, generating discontent in the group, regardless of the disciplinary field. Leading means making the changes that need to be made and having convictions, expectations and generating transformations. However, these changes are increasingly difficult to implement, due to macro

structural barriers; a problem that tends to worsen both in the scientific field and in the universities.

These findings could be interpreted in the light of different theories.

The Expectancy-Valence theory (Weiner, 1980; Feather & Davenport, 1981; Aparicio 2015a; Eden & Shani, 1982) offers an interpretative framework along the line: the higher the expectations for something that has a high value, the bigger the feelings of failure and helplessness when that is not possible to be achieved or does not meet the expectations generated.

From the “Investment-Model Theory” viewpoint (Becker, 1964), those who have reached a higher position and made a greater effort towards higher achievements of the group may expect more benefits, many of which are associated to management. Such benefits do not crystallize due to structural and organizational problems, having derivations in the behaviour of the Boss or Leader; behaviour that would be associated with the discontent found in the groups before a low “presence” of this psychosocial competence: leadership.

In short, the findings show an interplay between scientists, organizations and macro-structural contexts: bosses and members were part of a structural context which imposed important limits to promotion and development.

## **2 and 3) PICTO – IAM**

The low appreciation of Leadership as such, shows a shortcoming in terms of university training. In Latin America, in general, and also in our country, the disciplinary aspects continue to be emphasized. On the contrary, the countries that lead the ranking in terms of learning (cf. OECD, 2000, 2016 a and b, 2017 b, 2018), the focus is on procedural knowledge and knowledge for life, on action knowledge. Finally, you can see other relevant publications on the problem of competencies and, particularly, social competencies (Cf: Rychen, 2016; Grayling, 2017; Bentley, 2017; Steimberg, 2017; Raiz, Zubair, Shanboz, 2017; Laukonnen, Biddel & Gallagher, 2018; Ehlers & Kellerman, 2019; Shoom, 2021; Field, 2023. OCDE: 2015 a, 2015 b, 2015 c, 2015 d, 2015 e, 2017, 2018, 2022 a, 2022 b, 2023 a, 2023 b; OECD and ILO, 2018).

## **Conclusion**

The researches show low Satisfaction with the scientific leader and low valuation from the university PhDs; both are groups that have experienced a high professional-academic mobility.

In the research with scientists (R&D), the findings reveal that contentment among researchers varies depending on their professional mobility and disciplinary domains. In terms of leadership, the only common factor among researchers of the “hard sciences” and “soft sciences” was Dissatisfaction/Discontent or Nonconformity with the Chief/Director. In other words, this was the only common result among the multiple correlations analysed between Mobility, Professional Satisfaction, Product, Sciences “soft” and “hard” and Leadership.

Among Argentine PhD students and doctors (PICTO), Leadership as such is not mentioned, despite recognizing the importance of psychosocial and relational competencies, among other factors to be developed or prioritized when considering employability. If it is analysed according to trajectories the awareness of its importance (although it was observed through factors associated with Leadership but without referring to Leadership itself), increases within the framework of trajectories linked to exact and natural sciences and engineering.

Finally, among the Argentine exchange PhD students who participated in international academic mobility programs in France (IAM), the word was only mentioned once; word that was expressed by a graduate who came from one of the universities considered of excellence in the country.

This indicates a low awareness of its importance in the current work context, seen from the shared/social representations of the subjects (micro plane). And, linked to this, low awareness inferred from training institutions (mésó level), all of which will impact the possibilities of macro-national development and innovation (Aparicio, 2015a and b).

If we return to the hypotheses, the first one is not confirmed: Satisfaction concerning the leader in scientific organizations varies according to the disciplinary fields (soft and hard sciences). The second one, on the other hand, is confirmed: Satisfaction with the leader is not related to Productivity or Professional Mobility in the scientific pyramid (“soft” and “hard” sciences).

The findings are nonetheless surprising because, in academic debates and in daily life itself, this factor is frequently linked to achievement and innovation at the national micro, mésó, and macro levels; three planes that, in their self-sustaining interplay, constitute the pillars of the author's theory “The Three Dimensional Spiral of the Sense” (2015a and b).

This low appreciation of Leadership, both among scientists and university members of the highest level (doctorate/master), places the university institutions before a challenge: to reaffirm essential competencies currently for the management of organizations and for the development of individuals and countries.

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