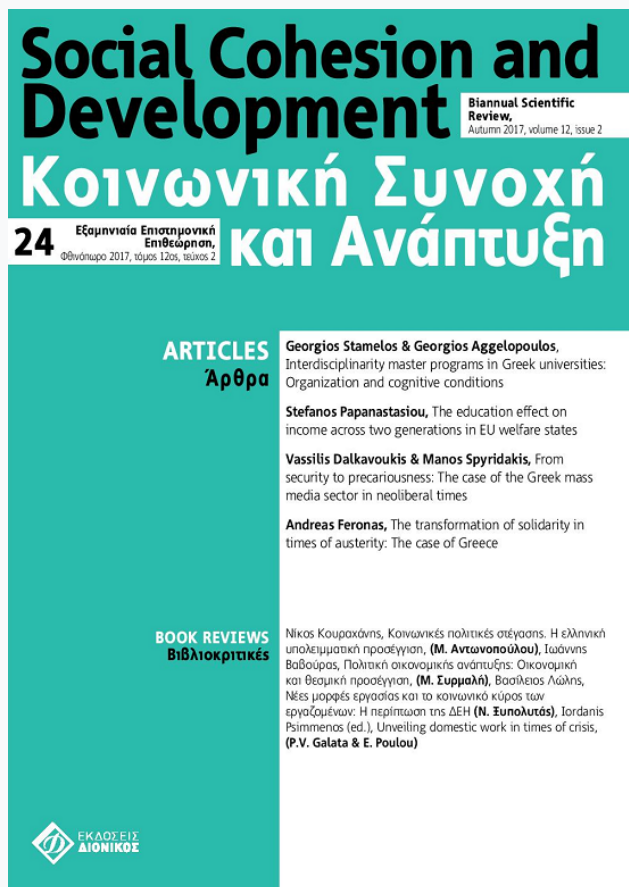


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Interdisciplinarity master programs in Greek universities: Organization and cognitive conditions

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Διεπιστημονικά μεταπτυχιακά προγράμματα σπουδών στα ελληνικά πανεπιστήμια: Οργανωσιακές και γνωσιακές συνθήκες

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ABSTRACT

This paper focuses on the development of interdisciplinarity in the Master's programs in Greek universities. For our analysis, we searched for tools from the Sociology of Organisations (Mayntz) and the Sociology of Science (Whitley). We argue that the University and its key actors have adopted interdisciplinarity, firstly, as a means to increase institutional funding, and secondly, with care so as not to disturb the internal institutional structure and the power relations between the key actors in the University. Indeed, on the one hand, universities, responding to the public calls for interdisciplinary programs, took advantage of the European support program for Greece in order to enrich their infrastructures. On the other hand, the new structures and functions (interdisciplinary Master's programs) remain loose and weak. So the central role of the Department and laboratories remains intact. As a consequence, the internal relations of the institutional actors are protected. Thus, interdisciplinarity seems to be a low priority issue. However, it is interesting to consider that more than 10 years after the end of European funding, the majority of these programs remains active.

KEY WORDS: University, Masters, interdisciplinarity, organization, cognitive conditions.

ΠΕΡΙΛΗΨΗ

Το κείμενο αυτό επικεντρώνεται στα διεπιστημονικά προγράμματα μεταπτυχιακών σπουδών των ελληνικών πανεπιστημίων. Για την ανάλυση χρησιμοποιήθηκαν στοιχεία από την Κοινωνιολογία των Οργανώσεων (Mayntz) και την Κοινωνιολογία της Επιστήμης (Whitley). Το βασικό μας επιχείρημα είναι ότι το πανεπιστήμιο και οι βασικοί συντελεστές του υιοθέτησαν τη διεπιστημονικότητα, πρώτον, για να αυξήσουν τους ιδρυματικούς οικονομικούς πόρους, και δεύτερον, με φροντίδα να μη διαταραχθεί η εσωτερική θεσμική δομή και ο συσχετισμός δυνάμεων μεταξύ των βασικών δρώντων εντός του πανεπιστημίου. Πράγματι, από τη μια, τα πανεπιστήμια ανταποκρίθηκαν στις δημόσιες προσκλήσεις εκδήλωσης ενδιαφέροντος για διεπιστημονικά προγράμματα, χρηματοδοτούμενα από Κοινοτικούς πόρους, με στόχο τον εμπλουτισμό των υποδομών τους. Από την άλλη, οι νέες δομές και λειτουργίες (διεπιστημονικά προγράμματα σπουδών) παρέμειναν χαλαρές και αδύναμες. Ως συνέπεια, οι εσωτερικές σχέσεις των θεσμικών δρώντων προφυλάκθηκαν. Έτσι, η διεπιστημονικότητα φαίνεται να είναι μια χαμηλής προτεραιότητας υπόθεση. Παρόλα αυτά, είναι ενδιαφέρον να δει κανείς ότι πάνω από 10 χρόνια από την ευρωπαϊκή χρηματοδότηση, η πλειοσύτητα αυτών των προγραμμάτων παρέμεινε ενεργή, τουλάχιστον ως τις τελευταίες θεσμικές αλλαγές.

ΛΕΞΕΙΣ-ΚΛΕΙΔΙΑ: Πανεπιστήμιο, Μεταπτυχιακά Προγράμματα Σπουδών, διεπιστημονικότητα, οργάνωση, γνωσιακές συνθήκες.

1. Introduction

The subject matter of this paper is the interdisciplinarity master programs (MP) in Greek universities. We focus on these programs for two reasons: First, interdisciplinarity, perceived of as a radical overturning of the view of knowledge, constitutes an epistemological challenge for the university since the production of knowledge is organized into single-science disciplines. On the other hand, interdisciplinarity, as a result of its radicalness - it is also termed a 'paradigm shift' according to Kuhn (1981)- can only constitute a powerful challenge for the specialized organizational structures and hierarchies of the mono-disciplinary fields upon which the traditional operation of the university is based (e.g. Faculties, labs, etc). In addition, the Master is that level of studies, where teaching and research co-exist. Consequently, the results of (interdisciplinarity) research (should) influence (interdisciplinarity) teaching. The second reason is because these programs were funded, during their establishment by the European Union within the framework of community support programs for Greece. Consequently, this factor is significant. It will appear in the analysis of our research but it does not constitute the objective of this article. Focus will be more on the manner of their implementation and the effects on the institution of the university, or, better, on the manner in which the institution handled the challenges brought about by the adoption of interdisciplinarity.

Indeed, the university isn't a passive receptacle of external policies. The relevant bibliography is rich concerning the way the university, as institution, reacts to the challenges it faces (Meyer and Rowan, 1977, DiMaggio and Powell, 1983, Suchman, 1995, pp.587-593, Silliance & Brown, 2009, p.1830). Consequently the general question arises regarding the way the university responds to and handles the challenge of interdisciplinarity, as much institutionally as at the level of actors. In addition, what is the role of the organization and operation of the disciplines within this challenge? The last point seems to us to be especially significant. In other words, we are particularly interested in understanding how the structure and operation of the social and institutional microcosm of a discipline facilitates or hinders the entrance and consolidation of changes, such as interdisciplinarity.

We consider the Faculty to be a pillar of university structure and function. So, it is crucial to analyze institutional and scientific/ cognitive challenges brought about by the integration of interdisciplinarity into MP. To do this, we searched for "tools" which would enable us to approach the conditions on which the application of interdisciplinarity depends.

In order to clarify these conditions, we turned to the Sociology of Organizations and the Sociology of Science. The first contributes to the determination of the various mechanisms that structure interdisciplinarity research practices, like the centralization (or decentralization) of the responsibilities in an institution, the standardization and prioritization of research activities and communication procedures, or the checking of the teaching and research work. Also taken into account is whether the interdisciplinarity research in an institution is the result of external influence (e.g., a funding agent) or is the product of compliance with preconditions set by evaluation committees, as well as whether the research teams were organized officially/formally or not. In order to determine these parameters we will use Mayntz's research work (1985). Her research work focuses on the way a research organization is formed and on the handling of problems its director is faced with.

The second – the Sociology of Science – sheds light on the cognitive conditions within which the interdisciplinarity postgraduate study programs operate. For the study of these con-

ditions (the connection of the cognitive aspects of our research) we chose the diagram for the classification of scientific fields that Whitley (2006) proposes. The concept of the field, however, is not easy to define since it is a multifarious and rich reality. Whitley, applying the methods of the Sociology of Science to study scientific fields, has proposed an analytical framework, which brings to light their important differences and also uses factors from the context to explain how the evolution of those fields can be influenced by specific actions of internal or external agents. More specifically, intellectual/scientific fields are considered to be (Whitley 2006) the social frameworks within which scientists develop abilities and research skills so that their actions can gain meaning in terms of the collective identity of the field they belong to, the objectives and practices, as those are mediated by the "leaders" of the scientific organizations and other social influences. These fields comprise the framework within which everyday decisions are made, and actions and interpretations on the part of the scientists take place. According to Whitley (2006, p.7), the intellectual/scientific field is a broad and general social unit for the production of knowledge. At this point it should be emphasized that Whitley's work is based on the theory of the scientific/intellectual world of Randal Collins (1975), who claims that the structures of the scientific specializations are determined by two factors: the "coordination of problems" and the "degree of uncertainty". Dividing these two factors he arrives at four formal structures for the organization of scientific disciplines.

Graph 1: Organization of scientific disciplines



Whitley calls the coordination axis the axis of mutual dependence and it is decisive for the present study, as it is with this "tool" that the cognitive conditions of interdisciplinary research will be determined.

As far as the cognitive conditions are concerned, Whitley, like Collins, claims that the scientific and social organization of a field can be understood through the axes "task uncertainty" and "mutual dependence".¹ The explanatory power of the two concepts stems from the fact that they combine the epistemological and the social sides of a research field. Mutual dependence² is related to how much a field depends on: a) the knowledge produced in other fields, so that the knowledge it produces can be integrated into general knowledge and b) other scientists. As mutual dependence increases, the competition³ for reputation and control of the direction of the research in the field intensifies. The same is true of the power of organizational borders and the identity of the field. The degree of mutual dependence has two analytically distinct aspects: the degree of functional dependence and the degree of strategic dependence. The first expresses the

extent to which the researchers have to make use of the research results, ideas and procedures of their colleagues in order to be able to produce knowledge capable of contributing to the promotion of existing knowledge. The second aspect refers to the extent to which the researchers must persuade their colleagues of the importance of the problem and approach they have chosen, in order to achieve fame and recognition, which will lead, of course, to funds and an academic career.

When functional dependence increases, the standardization of skills and training programs increases at the same time, the processes and duties become more specialized, while the scope of issues becomes more limited. When strategic dependence increases, scientists must persuade their colleagues of the appropriateness of their approaches in relation to the collective goals, a fact which leads to a theoretical coordination of the research. Within this climate, innovations must be added smoothly to existing knowledge in order to lead to recognition. Competition regarding strategies can lead to the creation of schools within a scientific field, which, while differing in terms of their research priorities and the conception of the central problems of the field, accept the competence standards and the correctness of others' results.

As far as the organizational conditions are concerned, we are interested in the study of the structure of an interdisciplinarity Master programs (MP). From the moment such a program is put together, while it is integrated into the pre-existing structure of the university, it nevertheless acquires its own organization. An interdisciplinarity MP constitutes a research organization per se with its own structure, the formation of which takes place through the influences that arise. The official distribution of roles and the administrative mechanisms that control and amalgamate the projects, including those that cross the official organizational borders, are considered as organizational structure (Child, 1972). Braun (1998) emphasizes the fact that this structure is shaped by relationships with other social sectors, mainly in the private economy and government bureaucracy. The organizational conditions of the research will be studied with reference to the work of R. Mayntz (1985). Her research work focuses on the way a research organization (a MP) is put together and on the handling of problems its director faces. Mayntz's conclusions have been used in research regarding interdisciplinarity MP (Lengwiler et al, 2004) and, more generally, scientific fields (Hohn, 1998).

According to this study, the structure of an organization can be described in terms of the following dimensions, which will be used as analytical axes in our research:

1. Degree of centralization or decentralization
2. Standardization. The extent to which there are strict rules for the actions, rights and obligations of the members of the organization.
3. Hierarchy. The number of hierarchical levels, vertical differentiation.
4. Flexible or inflexible division of labour.

2. The research

The research was carried out in two stages. During the first stage, all the MP at Greek universities were gathered with the aim of substantiating that we really had a dynamic entrance of interdisciplinarity MP, and so consequently establishing that there was a point to the object of our research.

In the second stage, we first of all clarified our focus, which revolves around two axes. Firstly, the internal procedures in the institution for the introduction of interdisciplinarity (institutional level). Secondly, the formation of disciplines in structured groups of social relationships, which may or may not facilitate the integration of interdisciplinarity (social development of the disciplines). Based on this focusing, we carried out field research using semi-structured interviews with actors who were carrying out interdisciplinarity programs, with the objective of investigating the conditions for the introduction and application of interdisciplinarity.

In order to select the institutions we rejected those with a very small number of interdisciplinarity Master's (<3) since they did not offer us serious guarantees concerning the balanced and organized adoption of interdisciplinarity. Based on this criterion, there were eight (8) universities with an adequate number of masters' (more than three). In those institutions, in the academic year 2010-2011, a total of 75 inter-faculties Masters' were offered. The majority of them (64) were joint programs between the Faculties of Sciences and the Faculties of Health Sciences. Nine (9) were interfaculty with participation from representatives of the Social and Human Sciences, while just two (2) were a partnership between Faculties of Sciences, Health Sciences and Social and Human Sciences.

From those eight (8) universities, four (4) were chosen: the Aristotle University of Thessaloniki (AUT), the National Technical University of Athens (NTUA), the University of Patras and the University of Ioannina (see appendix, table 1). The choice was made based on the following criteria:

1. The year of establishment, so that amongst those chosen there are older and newer institutions
2. To be located in the centre as well as the regions of the country
3. To present a variety of programs on offer
4. To offer innovative programs and, where possible, the research to be applied research.

A total of two (2) MP were chosen from each institution, in other words a total of eight (8) programs. From those, seven (7) were partnerships between Faculties of Sciences and Faculties of Health and one (1) a collaboration between Faculties of Human Sciences. The proportion has to do with the proportion in the total number of interfaculty MP offered.

In each program, four (4) interviews were held in total, one with the director of the program and the others with members of the teaching and research staff who teach on the program. In total, 32 interviews were held in the period from March 2011 to February 2012. Prior to the interviews, the study guides, web pages for the programs and any evaluations that happened to exist, were studied. This data collection constitutes a form of triangulation for the investigation of the same phenomenon (Denzin, 1994, p. 511). The interviews were semi-structured. While it would be interesting to give more on the discussion axes and focus points of the interviews, this would drastically restrict the presentation of the results which we consider to be the most important element of our article. Consequently, due to the existing restrictions, we decided against doing so.

Table 1: Master programs (2010-2011)

Universities	Total number of MP	Faculty	Interfaculty	Interuniversity	International cooperation
PATRAS	42	22	8	9	3
IOANNINA	40	15	4	19	2
THRACE	24	16		8	
AEGEAN	27	22	1	2	2
ATHENS SCHOOL OF FINE ARTS	2	2			
PELOPONNESE	15	10		2	3
IONION	10	8		1	1
HAROKOPIO	4	4			
WEST MACEDONIA	6	4		2	
THESSALY	31	22	1	4	4
AGRICULTURAL UNIVERSITY OF ATHENS	10	8	2		
ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS	20	10	6	3	1
PIRAEUS	17	14		2	1
CRETE	40	27	8	3	2
PANTEION	14	12	1	1	
TECHNICAL UNIVERSITY OF CRETE	7	6	1		
MACEDONIA UNIVERSITY OF ECONOMICS AND SOCIAL SCIENCES	13	7	4	2	
NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS	96	53	15	24	4
NATIONAL TECHNICAL UNIVERSITY OF ATHENS	28		19	9	
ARISTOTLE UNIVERSITY OF THESSALONIKI	65	48	11	4	2
TOTAL	511	310	81	95	25

3. Research results

Based on the theoretical framework we chose, what interests us first of all is, the investigation of, on the one hand the cognitive, and on the other the organizational, conditions of the MP.

As far as the organizational conditions are concerned, these are separated, as we saw, into those internal and external to the organization. In the internal ones, what interests us is a) the degree of centralization, b) the standardization, c) the hierarchy and d) the division of labour. The external ones concern the environment outside of the institution, which made possible the existence of the Master's (eg. educational policy choices, funding, labour market).

Regarding cognitive conditions, we have already said that we will focus on mutual dependence. Mutual dependence can be divided into functional and strategic.

There will follow the relevant presentation and analysis of the research findings.

3.1 Organizational conditions

A. Internal

A1. Organizational Standardization

The legislative framework provides for a common organization of the MP. The main body is the Special Inter-Faculty Committee (SIC) which is composed following a decision of the participating Faculties and two (2) representatives of the postgraduate students. The SIC is responsible for the drawing up and recommendation of proposals for the study program, the formation of committees for the choice or examination of candidates for places on the program, the establishing of advisory committees, examination committees, and so on. At the same time, there is the Plenum (with all the teachers who participate in the program) (N.3685/2008, ar. 2). The SIC has one director.

Based on the aforementioned, it emerges that the interdisciplinarity MP enter the operation of the university institution having a unified institutional framework with significant decentralized duties (eg. choice of students). Despite this, they are integrated into the university operation as an interfaculty partnership, so maintaining intact the basic academic unit of operation, the Faculty. Hence the verbal shift from interdisciplinary to 'interfaculty'. Characteristically:

- " 'Interfaculty' is characteristic of the institution. Interdisciplinary is a collaboration of theoretical approaches" (I 13).

A2. Degree of centralization

The relationship between the two bodies mentioned is depicted in the following extracts:

- "There is the SIC which is formed and renewed through the interfaculty meetings, and decides on all issues" (I 21)
- "I think that this body [SIC] is that which undertakes all the administration, it decides when the masters' presentations will take place, which students will be taken on, how the lessons will be" (I 25)
- "The Plenum convenes once a year, but the SIC is the body that takes the main decisions" (I 17).

Consequently, there appear to be two main characteristics of the administrative organization in question. Firstly, the existence of a small body that decides on all the fundamental matters regarding the Master's. Secondly, this body draws its legitimization from its prominence in the basic administrative body (General Assembly) of each partner Faculty.

A3. Hierarchy

So far, the degree of centralization in administration, in the sense that the SIC is as small as well as decisive body, has been made clear. Now it is interesting for one to see the role of the director of the SIC. The director is elected for a two years term of office by the members of SIC and must be a permanent professor or associate professor.

Despite the first impression given that the director is elected from a small body, the responses we received from 6 of the 8 Masters' we researched are interesting:

- "The director is one of us and coordinates. He doesn't play any other role. Each of us is autonomous" (I 11)
- "Since I'm a director too I'd say unfortunately that my role is even less than that of coordinator. Many times it ends up being purely a formality. You simply sign things, nothing else" (I 18).

As a consequence, the crucial point seems to be the participation in SIC and not the position of director, which appears to be a formality.

On the other hand, we have to consider the two Masters' where the personality of one professor dominates. In those it appears that the position of director is catalytic and absolute with both positive and negative comments:

- "Mr X is a clever person. He established this postgraduate course and made it well-known" (I 13)
- "Let me explain, since I created it and so I know. The program is innovative, even for Europe. We hold conferences, we organized a summer school and we have been given distinctions and awards" (I 32)
- "The good feeling everyone had has been lost. Some teachers changed, others were unhappy, they left and others came. There are reasons but I won't go into them. It didn't function democratically, some tried to gain control of it. It's a question of director" (I 24).

Ultimately it appears that the interdisciplinarity/'interfaculty' Masters' were either collaborations between a few professors from different Faculties who decided to create them, while at the same time respecting each other's autonomy through the way the SIC is organized and the operation of the Master's, or the initiative of one professor only who had the ability to create "his own" MP.

A4. Division of labour

Division of labour in its organizational dimension seems to be the responsibility of SIC. There, in 6 of the 8 programs that were examined, each professor ensured his own "autonomy" while the role of the director was merely a formality. Consequently, the members of SIC chose as much the students as the topics of their theses, based on their interests. At the same time, they determined the study programs and the other teachers. For instance:

- "We're not talking about partnership. The two Faculties that operate the program are independent. The projects do not need to be from both of them. The program is inter-faculty in name only. Contact takes place between them when it is judged necessary. But for someone to take on a project with 30% from here and 70% from there (...) those things just don't happen" (I 11)
- "Look, the professor is unchecked (...) of course when we give a syllabus, that has been approved. From then on, everyone does his own thing" (I 22)
- "The director phoned me one day and told me to teach a lesson. I considered it an honor" (I 7).

B. External

B1. European funding

European funding was vital to the existence of these MP until 2005. All those interviewed emphasized its significance.

- “We received good funding which allowed us to organize the program, to create new laboratories, to strengthen the infrastructure of the teams and to take on postdocs” (I 23)
- “With the European funding which lasted for a while we were quite comfortably able to buy equipment, expendable supplies and to invite external partners” (I 15)
- “(...) we received money and we put the infrastructure in place. You know, at that time we were all trying to get in, to pump money. If some didn't make proper use of it, they paid for it later (I2)
- “we relied European resources for funding. We got apparatus, held conferences, organized libraries and funded student travel” (I 4).

B2. After Community funding

The termination of Community subsidization created intense funding problems:

- “Now funding is scant. There is some misery surrounding this issue. Better not to talk about it” (I 31).

The participants in the programs we examined described various problems, which can be summarized in three axes: fees, research programs, relationship with the labour market.

B.2.1. Tuition fees

Some preferred to set fees and others didn't. Some extracts demonstrate the dilemma:

- “The expenses are covered by a kind of inscription rights and not by the tuition fees. Don't call them tuition fees. The university forbids that” (I 9)
- “I have no objection to our setting tuition fees. But will the students be able to pay them? Like this demand for the master's will drop” (I 17)
- “Don't ask me about money. I haven't been paid for other activities. That's how we used to work in the past, now what the young do, I have no idea. We were used to doing everything on our salary, academic research and everything” (I 10)
- “It's not taboo for students to pay. There are many expenses. Student transportation costs. We sometimes take money from them to cover the expenses, but we haven't made it official. We don't call them tuition fees because they are not of a permanent nature. Isn't it better to know you'll have that amount from there, so as to plan your work? Finding money is a constant battle” (I 28)

B.2.2. Research Projects

Funding from research projects seems to constitute an important alternative source of funding for the Masters'.

- “In reality, funding is limited (...) those we take on in our lab are part of some projects. They are part of a broader project, a European one (FP7) or a Greek one (Thalis), a project from America and so on” (I 2)
- “Part of the expenses that concern mainly expendable goods for the support of postgraduate experimental programs are covered or are expected to be covered by funding from the participating laboratories, which comes from competitive research projects or from donations, benefits, subsidies from agents in either the public or private sector” (I 15)

- “Now funding has been cut we are forced to replace it with projects that the laboratories have. There is no other way” (I 22)
- “Our laboratory has quite a few projects, both European and other. To cover its needs we can transfer some money from those to the MP. However this is not a solution” (I 27).

B.2.3. Public and Private Sector

Another source of funding seems to come from partnership with the public or private sector.

- “Until now we received funding from the Ministry of Culture, and the Polytechnic. Now this has been cut. We had minimal funding from the Polytechnic for transport and we managed. As we don’t have tuition fees, if we are in real difficulty we ask the students for a contribution, if we don’t find somewhere to stay from the council, the church or anywhere else. In Agiaso (Island of Lesbos) the church offered us somewhere to stay” (I 16)
- “I know that some colleagues have projects from companies, from town councils, they “contribute” in this way to the MP” (I 13)
- “The private individual will come to me, I will set up the project team (...) From this funding we always divert a little something to the MP. Everyone does it” (I 15)
- “The issue of the production and management of solid and liquid industrial waste is a heated issue (...) Town councils as well as industries have approached me and through the Research Committee we have received a lot of studies. We do studies with the students. It’s only reasonable that there will be a payment for them” (I 18)

3.2. Cognitive conditions

A. Functional

A1. Standardization of study programs

The standardization of the study programs in this particular case concerns the attitude towards the interdisciplinarity that governs the contributing factors of the MP and its realization at the level of courses on offer.

1. The perception of interdisciplinarity

a. Interdisciplinarity as “contribution”:

- “It is the contribution of each discipline to knowledge” (I 10).

b. Interdisciplinarity as “working together”:

- “interdisciplinarity is a more general concept that concerns cooperation between different disciplines in order to investigate a natural phenomenon from all angles, as completely as possible” (I 23)
- “It is the cooperation with teams that function to complete each other” (I 11).

c. Interdisciplinarity as “partnership”:

- “the collaboration of different cognitive areas” (I 8)

d. Interdisciplinarity as “combination”:

- “I understand the term interdisciplinarity as if you have different objects which converge on a common object which is bigger or wider than its cognitive object” (I 31)
- “Interdisciplinarity is when you see the same thing from different angles” (I 21).

Whichever the key-word is for the definition of interdisciplinarity, what appears is that it is understood more as multidisciplinary in the way Klein defines it (1990), in other words as an additive and not as an integrated process (which should characterize interdisciplinarity). This

view shouldn't surprise us since these MP emerged as collaboration between particular Faculties, which in addition are differentiated in the internal university hierarchy. Characteristically: *"discourse is interdisciplinarity, but it degenerates perhaps at the level of multidisciplinary. In Greece the process is more marked due to the dominance of certain disciplines fields (...) the civil engineer dominates the works, while the land planner should also have a say"* (I 12).

2. Formation of the study program and determination of the skills for development

- "the program is shaped through the contribution of both participating Faculties. On this particular postgraduate course we have four courses in administration taken by Information Technology students. In the second semester they make their choices. It is very successful" (I 16)
- "the courses are often designed by a professor from one field with the result that interdisciplinarity may not infiltrate the same course" (I 4)
- "in the first semester we have courses from Chemistry and Biology and from Pharmaceutics and Medicine. In this way the students acquire a grounding in the cognitive subject areas" (I 15)
- "Each teacher teaches the cognitive subject area that he is familiar with. I was asked to teach Pharmacology. I told them that I couldn't" (I 18).

The way in which the study programs are put together, then, seems to stem from the scientific fields from which the teaching stuff come and is related more to the familiarity of the students with areas with which they did not have any contact during their undergraduate studies. In essence, this is where the statement of interest for the development of new skills lies.

A2. *The determination of theses*

The application of interdisciplinarity to determining the subject matter of theses is important in the sense that it determines research activity within the context of an interdisciplinarity Master's.

Some responses help us to understand this better:

- "the student is integrated into a laboratory (...) and takes on a topic suited to the research projects that are current" (I 23)
- "I believe that in practice the determining of the topic takes place based on the professor's interests, it needs to be a subject area that coincides with the research he is doing" (I 26)
- "Each laboratory is autonomous and has its own obligations. We do work with each other however. If the need arises, we will send a student to use the equipment in another laboratory" (I14)
- "we work together when it is necessary. Regarding the thesis, the student is allocated to the laboratory he chooses, as long as he does what the laboratory is researching, of course" (I 12)
- "in the program, research is bibliographical. Through reading, the student will understand the interrelation. I am doing a subject, Ethics and Knowledge. Knowledge can be subject to ethics. An assignment in my course has an interdisciplinarity stamp (...) the program is interdisciplinarity, not the assignments!" (I 25).

From these extracts it appears that the determining of the topic of the thesis is determined by the operation of the laboratories involved. In addition, the laboratories with the most projects attract students more for financial reasons. So, the "interdisciplinarity" of the research is limited to laboratories helping each other out.

Of course, it should be noted that in the case of a Master's at the Polytechnic, due to the nature of the subject matter, it seems that interdisciplinarity is more in evidence: "we have for the thesis the topic of the design of a riverside park. The engineer will find a technical solution. The architect will provide the plan. The economist will take it and give the cost and the value of the park based on the money that people would pay. The lawyer would deal with the legal parts" (I 26).

B. Strategy

B1. Specification of collective goals

In this unit the program objectives of the particular MP were examined, with the awareness that the institution's official announcements aren't always identical to actual behaviour (Meyer & Rowan, 1977). Despite this, the announcement of the setting of objectives was an essential requirement for funding (initially from European funds) in the sense that it had to be in line with policy choices promoted through the announcement of the invitation for the submission of applications for funding.

Some examples taken from the course handbooks are characteristic:

- "The subject of the MP is Biotechnology. Its objective is the provision of postgraduate education in biotechnology and bio-medical technology and the preparation of scientists for an excellent career in the areas of basic and applied biotechnology, research and teaching" (I 9).
- "The subject is the creation of high-level specialized individuals in the areas of Information Technology and Management with emphasis on and specialization in Information Systems and their use in the Science of Management" (I 23).
- "The MP aims: at the development of research and the promotion of knowledge in the wider area of the Science of Technology and Polymers, at the improvement of the competitiveness of the Greek scientific workforce, at the creation of a new, suitably trained scientific workforce..." (I 30).

Based on the above extracts one could claim that the depiction of the objectives of the cognitive dimension of the Master's is linked more to the demands of the funding announcements for such programs of study and less to the reality so far analyzed.

B2. Coordination of the research work

The way in which the subject matter of the theses is determined has in essence already been answered by this point. Coordination takes place more based on the activities and programs of the laboratory and less on the needs of the study program. The next extract is indicative: "once we have set the courses with the SIC, what we do in our laboratories is our business! Of course the students go to other laboratories – they undergo a kind of rotation (!) – but no one comes to see what's going on or to check me" (I 10).

4. Conclusions

The stated objective of this work was to analyze the research results on the base of the four dimensions of Mayntz and Whitley theoretical works. From our analysis, we can state that:

As far as the organizational conditions are concerned, the new Master's programs acquire their own structure. However this is weak and is not fully functioning, as it remains under the supervision of the participating Faculties (and their laboratories). More specifically:

- A) As far as the question centralization-decentralization is concerned, the first impression is that a new decentralized structure and organization is created. However, since this is weak it is wholly dependent on the internal arrangements of the participating Faculties (and their laboratories). Ultimately, it is a dependent decentralization.
- B) As far as the question of standardization is concerned, the legislative framework provides for a specific structure-administration-operation. In essence however, even if the legislative provisions are implemented, this happens in a loose and weak way. Hence, the existing structure, administration and operation of the dominant Faculty (and its laboratories) are not disturbed.
- C) As far as the hierarchy is concerned, due to the aforementioned, although this exists and indeed is centralized with one head and a small number teaching staff involved, in reality this is just a loose confederation of powerful actors from the participating laboratories and/or Faculties in which everybody wants to, and can, maintain his independence. There are of course cases where there is just one powerful actor.
- D) Hence, research and its link with teaching promotes the laboratory as dominant, which while it collaborates with other laboratories, in order to receive European funding, maintains on the one hand its operational independence and on the other, its contacts with the external environment which are linked often enough with additional sources of funding.

As far as the cognitive conditions and the criteria of mutual dependence are concerned, our research revealed the following:

- A) Concerning function dependence, this seems to remain at the level of facilitating when a laboratory requests help from another laboratory on the same program in order to be able to carry out its own work. Consequently, function dependence doesn't lead to specialization or at least to coordination in the sense that it's not about a common project but the carrying out of separate projects by each laboratory.
- B) Concerning strategic dependence, this, to the extent that it is achieved, is linked to external conditions and not to the theoretical coordination of the research. In other words, it doesn't have a cognitive base. More specifically, 'dependence' is a product of the funding requirements first and foremost, and only secondly a scientific need.

Finally, since reality is more complex and multi-level, it is necessary to conclude with a paradoxical observation. Based on the previous finding, one could conclude that with the end of European funding, all of these programs would cease to operate. Actually, the opposite is true. More than a decade after the funding stopped, most of these programs continue to operate.

Notes

1. In the present study only the parameter of mutual dependence will be used. This is because – as Whitley observes (2006) – all sciences are characterized by a high degree of uncertainty since – committed to the production of innovation – they conduct research activities the results of which are uncertain and not predictable.
2. Fuchs (1993) believes that this concept has its roots in Durkheim's "solidarity", which expresses the degree to which compliance is achieved in a society. The more homogenous a

- society is, the greater the pressures exerted are for compliance with the rules, with the result that the particular society is demarcated by others.
3. The fact that competition is the dominant characteristic of the scientific field has been highlighted in the past by Bourdieu (1991), who believes that these conflicts between scientists stem from the unequal distribution of capital/habitus, a fact that results in unequal access to resources, as well as by Hagstrom (1974) who claims that due to competition, scientists often change specialization and become more secretive. Earlier still Merton (1968) – endowing in fact this competition with an economic dimension (quasi-economic competition) – used the term “Matthew effect” to characterize the undesirable competition in science, in other words the prominent scientists achieve greater recognition in comparison with unknown researchers, even when their scientific work is similar.

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