



SEVENTH FRAMEWORK PROGRAMME

Report on the obstacles to setting up a “real” multi-institution Masters course in Optical Telecommunications and Networks based on the “virtual” masters course set up in the EphotonONE and BONE NoEs

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Executive Summary :

The teaching workpackages of the ePhotonONE and BONE NoEs have defined and assembled teaching material for a “virtual” masters course in optical telecommunications networks. With a view to creating a “real” masters course, jointly run and organised by a number of BONE partners across Europe (sharing teaching best practice and expertise) this report investigates the major practical obstacles to setting up such a course. The report compiles and compares the experience of running similar courses in BONE academic partner institutions in Belgium, Croatia, France, Italy, Spain and the UK.

The main conclusions are that differences in masters course duration (1 years in some countries, 2 in others) and fees (ranging from 0 to 7000€/year), requirements for minimum residence periods/credits in some institutions in order to award degrees and availability of short term accommodation are likely to be the major obstacles to setting up a course where students follow different modules in different institutions, either by travelling between institutions or by distance learning. Teaching language, course dates, lesson times, internship period requirements, joint awarding of degrees and entrance requirements do not appear to be major problems.

A possible course organisation is proposed to reduce the impact of the identified obstacles. It suggests a 2 year, semester based, course. To avoid over-specialisation, the first year would have a more general Electrical Engineering/Telecom/Networking content and would be followed in the host institution. The second year would be based on the BONE masters content, each module being taught by a different partner institution. Students would spend two periods (semester or internship project) in at least one other partner institution. Students would follow modules either directly in the teaching institution or by video-conference distance learning. Exams and marking would be common for all students.



1. Introduction

During the EPhotonONE project teaching workpackage, numerous partners (both academic and industrial) successfully worked together to define the scope, content and structure of a masters course on optical telecommunications networks. The aims were a greater integration and harmonisation of the various masters courses being proposed in the field across Europe, spreading teaching best-practice, sharing expertise and facilitating exchanges of students and improving first job employment prospects of students outside their home country.

Once these points had been agreed upon, a website describing this “virtual” masters was set up and teaching material for the course in the form of lecture slides, practical class descriptions and examination material was collected from numerous EPhotonONE partners.

The BONE teaching workpackage (WP02) aims to further integration in this direction by moving beyond a “virtual” masters towards a “real” masters course based on the content and teaching material. Various actions have been planned to do this: updating, improving (through a peer review process) and extending the teaching material already available, adding new modules and teaching material to the “virtual” masters course, teaching various modules of the “virtual” masters courses in “Summer Schools” and experimenting with the use of distance learning techniques where possible to make the “summer school” lectures simultaneously available to students in several BONE partner institutions. The subject of this report is another action with the same aim – the formation of a subgroup across partners from several nations to study the practical obstacles (and propose potential solutions) to setting up a multi-institutional, international “real” masters course based on the “virtual” course defined and prepared in BONE WP02. The emphasis here strictly concerns the practical, organisational difficulties and does not address the technical course content which is covered by the BONE “virtual” masters activities.

2. Methodology

The method used to conduct this study was to first approach a number of representative partners from different European countries with experience in national masters programs in areas related to optical telecommunications networks – contributors of teaching material to the virtual masters being particularly attractive. These contacts were made at the plenary and WP meetings, at the Summer School held in Mons and by email. Based on discussions with these contacts, the subgroup was formed and a simple questionnaire established addressing the problems that were, in the contributors experience, the major practical stumbling blocks when attempting to set up multi-national courses. The resulting questionnaire is given in the next section. Each participant then filled in the questionnaire, after consulting when necessary with the relevant authorities in his host institution and country. The responses to the questionnaire were then summarised (see section 4) and conclusions drawn. These conclusions were then sent out to the partners for further comment and discussion. The convergence of these comments led to the present report which we hope is a useful analysis of the practical problems that must be solved in order for a “real” masters course to be built on the structure and content provided by the BONE “virtual” masters.



3. Questionnaire

Below is the email and initial questionnaire sent out to the members of the obstacles subgroup.

Note that different ways of setting up a “real” multi-partner masters are envisaged in the questionnaire:

- distance teaching – students remain in their host institution but courses (and exams) are shared across the participating institutions. Logistically (and probably administratively) this would appear to be the simpler option.
- student mobility – students move from one institution to another to follow the different modules. Logistically more complicated but probably more attractive and stimulating for the students and providing much greater European integration opportunities : discovery of language, work practices, local markets and regulations etc.
- a combination of the above approaches.

Hello everyone,

when I met most of you for the last time at the BONE kickoff meeting in Turin, I asked you if you would accept to be part of the teaching subgroup looking into obstacles (and solutions) to setting up a "real", multi-institution joint masters course in optical telecommunications as opposed to the current "virtual" course. The final deliverable is still some time away, but we need to make some kind of start before the next WP02 meeting in Mons. Could you all at least start thinking about and if possible start to collect information on the following points so that we can discuss them properly at the Mons WP meeting:

1. Entrance requirements for a Masters course in your country/institution.
2. Logical duration of such courses (1 or 2 years ?) in your country/institution.
3. Minimum duration/credits of courses required in your institution to be able to deliver a degree/diploma.
4. Rough annual costs for students of similar courses in your country/institution
5. Acceptability of courses and exams in English.
6. Acceptability of jointly awarded degrees with other institutions
7. Usual start and end dates of teaching terms
8. Availability of student accommodation on monthly or term duration basis.
9. Does such a Masters course allow for an industrial/academic internship project ? What duration ? Is the project mandatory ?
10. Would it be possible to share teaching modules with existing courses ?
11. What are the usual lecture start and end times/days in a given week at your institutions (distance teaching compatibility) ?

These are the immediate practical problems that spring to my mind. If you can think of or have experience of any others please add them.

Looking forward to meeting you again in Mons and/or Rome.

Best wishes.

Kevin Heggarty



4. Summary of questionnaire responses

1. Entrance requirements for a Masters course in your country/institution

Belgium	Science Bachelor's (180 ECTS) subject to jury's acceptance of equivalence. "Bridging" courses available
Croatia	Science Bachelor's (180 ECTS) in Electrical Engineering or Computing.
France	Science Bachelor's (3 or 4 years university education) in science based subject.
Italy	Science Masters course (5 years university education)
Spain	Usually graduate degree in physics/engineering, 180 credits possible subject to acceptance by committee
UK	Science Bachelor's 2.2 or better

2. Logical duration of such courses (1 or 2 years ?) in your country/institution

Belgium	2 years (1 year if already holds masters degree)
Croatia	2 years
France	2 years
Italy	1 year maximum
Spain	60 to 120 ECTS (usually 1 to 2 years)
UK	1 year

3. Minimum duration/credits of courses required in your institution to be able to deliver a degree/diploma

Belgium	120 credits (60 possible if already holds masters degree)
Croatia	2 years (120 credits)
France	1 year
Italy	60 credits (1500hrs)
Spain	1 year
UK	11 months – credits system not used

4. Rough annual costs for students of similar courses in your country/institution

Belgium	833€ (6000€ living expenses)
Croatia	0€ to 1000€ for 2 years of course
France	3000€/year (5000€ living expenses)
Italy	7000€
Spain	2200€ to 3200€ depending on the number of credits
UK	£3000+1500 for EU (+£9000 living expenses)



5. Acceptability of courses and exams in English.

Belgium	60ECTS in English (exceptions permitted for international programs)
Croatia	Yes
France	Yes – but usually mixed English/French
Italy	Yes
Spain	Yes – many degrees already in English.
UK	All teaching English

6. Acceptability of jointly awarded degrees with other institutions.

Belgium	OK if minimum of 30 credits in each institution
Croatia	OK
France	Possible – formal institutional agreement required
Italy	Possible – formal institutional agreement required
Spain	OK – joint degrees already exist - formal institutional agreement required
UK	Very rare at Cambridge, particularly for 1 year courses, exists at Bachelor's level.

7. Usual start and end dates of teaching terms.

Belgium	15 Sep – 20 Dec (14 weeks), exams, 1 Feb – 31 May, 5 weeks exams
Croatia	2 nd Monday September to 3 rd Friday June.
France	Sept-Jan, Feb-Jun 30 th (2 nd year : Sept-Jan and Feb-Sept)
Italy	Flexible - no constraint in principle
Spain	Flexible, usually semester based Oct-Jan/Feb and Jan/Feb-June but 3 terms are also possible : Oct-Dec, Jan-Mar, Mar-Jun.
UK	Oct - Dec (8 weeks), Jan-Mar (8 weeks), Apr-Jun (8 weeks). Dissertation (Jul - Sept) - 10 weeks

8. Availability of student accommodation on monthly or term duration basis.

Belgium	Available by semester
Croatia	Available yearly, term or monthly.
France	Available yearly, term or monthly.
Italy	Difficult – lack of student accommodation. Case by case basis.
Spain	Yes, yearly, term or monthly possible.
UK	Usually for one year (may be possible for short periods if in exchange scheme)



9. Does such a Masters course allow for an industrial/academic internship project ? What duration ?

Belgium	Mandatory, 20-30 credits max, project in host university lab or industry.
Croatia	Yes, 3 months, mandatory ?
France	Yes, > 4 months, mandatory
Italy	Possible (ECTS can be awarded) but not mandatory
Spain	Mandatory, usually 12 to 20 ECTS, not necessarily in industry.
UK	Yes, 10 weeks, mandatory.

10. Would it be possible to share teaching modules with existing courses ?

Belgium	Yes
Croatia	Yes
France	Yes, subject to timetabling constraints - must be carefully organised in advance
Italy	Yes, but must be carefully organised in advance.
Spain	Yes but not possible for all cases – timetable to be checked on course by course basis.
UK	Yes

11. What are the usual lecture start and end times/days in a given week at your institutions (distance teaching compatibility) ?

Belgium	8:15-12:30 and 13:40-17:50, Mon-Fri. Saturday morning possible.
Croatia	8:00-20:00
France	9:00-18:00
Italy	8:30-19:30 Mon-Fri
Spain	9:00-21:00
UK	9:00-13:00 and 14:00-16:00

4.1 Notes

Spain (UC3M) : Setting up such a course would probably involve significant extra work compared to a single institution course. The availability of some form of pump funding (EC ?) for the initial starting up period (a few years) would significantly increase the likelihood of such a course being set up.

UK (UCAM) : traditionally very few joint courses, now becoming possible.

5. Analysis and Discussion

- a) Teaching language is not a major problem, English is now very widely accepted (and in many cases encouraged) as a common teaching language across the institutions and countries in this study.
- b) The principle of institutions jointly awarding degrees has also now become widely accepted (with fewer and fewer exceptions – e.g. Cambridge for specific and historical reasons) and should not be a major stumbling block. However, currently joint degrees are generally only between two institutions so a multi-partner arrangement would be breaking relatively new ground. It is clear also that a formal agreement would be required between the participating institutions in order for a jointly awarded/recognised degree to be possible.
- c) Nearly all institutions require students to spend a minimum amount of time or obtain a minimum number of credits in their institution in order to award a degree (jointly or otherwise). The question of the requirement of the physical presence of students is not always clear so the possibilities of students following courses (including exams) given in one institution by distance learning while physically present in another participating institution has yet to be fully addressed – probably because so far it is a rare occurrence. Again this would appear to be breaking new ground and would require careful definition and formal agreement which may not be immediate in some institutions.
- d) The possibility (or requirement) for an extended internship project in industry or an academic laboratory during the course is also now becoming general practice across the study group. There are, however, differences in the duration and whether this is mandatory which would require harmonisation before a jointly awarded degree could be set up.
- e) The principle of sharing teaching modules between a new joint masters and existing courses (by experience a particularly important point for such a course to reach economic viability in each institution) is also generally accepted. The major difficulty on this point is far more likely to be on a practical timetabling level – something each institution would have to address internally.
- f) Course dates are reasonably similar across most of the institutions and in most cases there appears to be sufficient flexibility for this not to be a major problem. The most likely stumbling block is the fact that some institutions run on a three term per year basis and others (majority) on a two semester per year basis. Similarly the timing of project work may be problematic. In many institutions the project runs over the Summer with a report/defence in September whereas some institutions require the course to end in June.
- g) Entrance requirements for candidates to a common masters course also appear to be very similar with a requirement for a science/engineering degree around the bachelors or equivalent level (obviously the Bologna process “bachelor-master-doctorate” is gradually being applied) ... with only one real exception in the group of institutions covered here : PoliMi (Milan, Italy). With some flexibility from the participating institutions this should not be a major blocking point.
- h) With a view to distance learning by video-conference, the differences in the usual teaching hours in the different countries would appear to be a only a minor problem: for example teaching in the UK finishes particularly early compared to that in Spain (at UC3M at least). The different time zones will, however, help with this.
- i) Accommodation is likely to be a serious problem should the option of a course involving considerable student mobility (for different modules for example) be

chosen. Some institutions can offer accommodation on a monthly basis, but others can only offer accommodation on a semester or year basis.

- j) Course fees would appear to be another major practical problem with very wide variations across even this relatively small sample of European institutions, ranging from 0€ per year to 7000€ per year. This is likely to be one of the hardest obstacles to overcome as in some (many) cases the fees are dependant on national political decisions and the institutions involved do not have much freedom to vary the fees. The questions of where the different participating students are enrolled (which institution), to whom they pay the fees and how the fees are shared out between the institutions contributing to teaching in the course must also be addressed at the same time as the fees are fixed. Some way to harmonise fees must be found otherwise students would be tempted to enrol at the institutions offering the lowest fees, distorting the balance and making it economically non-viable for some institutions to participate.
- k) Overall the major obstacle at present however, would appear to be the lack of a consensus on the duration of a masters course (the Bologna process is obviously still “work in progress” on this point !). In some countries/institutions it is a 1 year course, in others 2 years are required. Some of these differences may spring from the need for short answers to the questionnaire format whereas the masters situation is still complex in some countries with different types of masters in different institutions (for example between the University and Grandes Ecoles systems in France and the existence (historically) of different Engineering degrees in Spain). This also leads to some fundamental questions about the masters course : the current BONE “virtual” masters course structure and content roughly corresponds to one year of study – whereas the Bologna process and the majority of the institutions contributing to the present study expect a masters course to correspond to two years of study. Adding modules and teaching material to the current “virtual” masters course to extend it to two years is a possible option but this may well lead to a course that is too specialised (what are the yearly requirements in Europe for new masters level engineers with two years of specialisation in optical telecommunication networks ?) and hence would be unattractive to students and/or lead to employment bottlenecks for graduating students.

6. Proposals for possible “real” masters course structure

Based on the responses to the questionnaire and the above analysis, the following basic structure and practical organisation for a masters course based on the BONE virtual masters course is proposed. The aim has been to take into account the major obstacles identified in the subgroup and to set up an organisation which would avoid or minimise the consequences of these obstacles as much as possible and hence increase the chances of a “real” masters course being set up. The proposition is simply a proposition and many points may need to be modified for them to be acceptable to a majority of possible participants. Other masters structures are also possible and extensive further discussion both within and beyond the workgroup would be required before the structure could be finalised. The remarks in square brackets “[]” after each point explain the reasons for each choice with references to the conclusions drawn in section 5.



- A 2 years masters course, of which only the second year would specialise in Optical Telecommunications Networks based on the BONE “virtual” masters. The first year would cover more general Telecommunications, Electrical Engineering or Computer Networks subject matter – with students probably enrolled in existing courses in the host institution. [Compatibility with Bologna process and majority of institutions, full use of BONE “virtual” masters, avoids over specialisation: points c), e) and k) above]
- A semester based organisation with an additional mandatory final year internship project from May/June to September in industry or an academic laboratory. [Points d) f) and i)]
- The first semester of the two year course would be followed in the student's “host” institution where the student is enrolled. [Points b) and c)].
- Over the two year course students must spend two periods in at least one participating institution outside their home institution, either two semesters or a semester and the final project. [European aspects, attractiveness to students, sharing expertise and resources].
- Entrance requirements at a Bachelor's level in a scientific/engineering subject, but also based on CV, recommendation letters, previous educational establishments, experience and academic results. Interview at one of the participating institutions (preferably “host”) and final acceptance by committee made up of representatives of participating institutions (video-conference discussions ?). [Point g)].
- Fees around 2-3000€ per year, paid to the host institution and redistributed to participating institutions according to an agreed formula based on teaching contributions and numbers and duration of students present in each institution. [Point j)]
- Teaching during the 2nd year in English based on the BONE “virtual” masters courses. Each participating institute would run at least one of the modules, teaching students present in that institution face to face and by distance teaching video-conferencing. Expected teaching times 9:00-13:00 and 14:00-17:00, continental European time. Similar laboratory sessions duplicated at as many institutions as possible but flexibility required on this point. [Points e) and h)].
- Common exams for all students in the 2nd year modules (distance learning PC based ?), all papers marked by the module leader. [Integration and mutual recognition].
- Degree awarded by host institution with some form of label/accreditation (“European” “BONE” ... ?) from the other participating institutions indicating that the course involved modules run by their institution and that the degree is recognised by their institution. [No well recognised practical structure at present for European level awarding of degrees – political effort required to do this is out of the scope of the participating institutions].