



Structuring European Biomedical Informatics to Support Individualised Healthcare

IST-507585

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# **Training and Mobility Action Plan**

**WP3 – Training and Mobility**

**Deliverable D7**

**v1.3**

**Final**


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## 1. DOCUMENT HISTORY

Name	Date	Version	Description
E Molero, M Weeber, G de la Calle, J Villa	27/01/05	v1.0	Document Creation – First Draft
C Diaz	01/02/05	v1.1	Deliverable review
M Mewissen, HP Eich, J van der Lei	08/02/05	v1.2	Formal review
I Hermosilla	11/02/05	v1.3	Consortium review

## 2. DEFINITIONS

- Partners of the INFOBIOMED Consortium are referred to herein according to the following codes:

**FIMIM** – Fundació IMIM (Spain) – Co-ordinator

**IMIM** – Municipal Institute of Health Care (Spain) – Contractor

**ISCIH** – Institute of Health Carlos III (Spain) – Contractor

**KI** – Karolinska Institute (Sweden) – Contractor

**UEDIN** – University of Edinburgh (UK) – Contractor

**CUSTODIX** – CUSTODIX nv (Belgium) – Contractor

**UPM** – Polytechnical University of Madrid (Spain) – Contractor

**UAVR** – University of Aveiro - IEETA (Portugal) – Contractor

**FORTH** – Foundation for Research and Technology (Greece) – Contractor

**FUNEN** – Danish Centre for Health Telematics (Denmark) – Contractor

**INFORMA** – Informa S.r.l. (Italy) – Contractor


**HHUD** – Heinrich-Heine-Universität Düsseldorf (Germany) – Contractor

**MI-EMC** – Department of Medical Informatics, Erasmus University Medical Centre Rotterdam (The Netherlands) – Contractor


**HNPCC** – The Danish HNPCC-register, Hvidovre Hospital (Denmark) – Contractor

**ACTA** – Academisch Centrum Tandheelkunde Amsterdam (The Netherlands) – Contractor

**AZ** – AstraZeneca Research and Development Mölndal (Sweden) – Contractor

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- **Network:** The INFOBIOMED network as defined by contract IST-2002-507585.
- **Work plan:** Schedule of tasks, deliverables, efforts, dates and responsibilities corresponding to the work to be carried out for the INFOBIOMED network, as specified in Annex I to contract IST-2002-507585.
- **Consortium:** The INFOBIOMED Consortium, conformed by the above-mentioned organisations.
- **BMI:** Biomedical Informatics
- **BI:** Bioinformatics
- **MI:** Medical Informatics
- **NoE:** Network of Excellence
- **WP:** Work package

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### 3. INTRODUCTION


This document aims at presenting the action plan for training and mobility activities to be carried out by the INFOBIOMED Consortium. To provide the necessary background information, but without entering into details that are covered by other deliverables, it is to be remembered that INFOBIOMED is a EU funded Network of Excellence whose objective is to structure European Biomedical Informatics to support individualised healthcare. This is done through a collaborative effort between Bioinformatics and Medical Informatics to bridge the gap between them.

Within INFOBIOMED, WP3 is devoted to the promotion of training and mobility activities, as a way to contribute to the achievement of the ultimate goal of setting a durable structure for the described collaborative approach, by building the needed research capacity for enabling the consolidation of BMI as a crucial scientific discipline for future healthcare.

This deliverable presents the objectives of WP3 - Training and Mobility, as well as the specific activities 3.1 Training and 3.2 Mobility objectives, and how they contribute to the general NoE's goals. Then, a general overview of what has been done in the first year of the network with respect to training and mobility is described, including the breakdown by tasks and the general activities carried out. After that, the Training and Mobility activities are tackled in two separate chapters, entering into the details of what has been done so far and what are the plans for the future in both cases. Finally, an annex chapter includes internal reports and supplementary information of the activities completed up to present.

### 4. TRAINING AND MOBILITY OBJECTIVES

The Training and Mobility WP is an essential component of INFOBIOMED, as it has a direct impact on building a solid and durable scientific community gathering BMI professionals at the European level.

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Training is aimed at allowing BMI scientists to update their knowledge on the subject, it will help other scientists working in Medical Informatics, Bioinformatics and other related fields to understand how they can enrich their research by taking advantage of BMI approaches, and will educate future BMI scientists and professionals. Mobility will contribute to strengthen the complementarity among scientists and organizations and help to develop mutual specialisation. Mobility is also aimed at promoting the joint use of research infrastructures and other integrative initiatives.

#### 4.1. Training objectives

Training is one of the activities intended to spread the excellence beyond the Consortium frontiers. It has been agreed that an improvement of the training and education in BMI at the European level is needed if Europe is to become a key player in this emerging discipline. The training action plan should aim at offering to the involved scientists and students the necessary knowledge, skills and ethical principles to apply IT to the biomedical research and practice.

The plan designed to achieve the aforementioned objectives consists on, first of all, becoming aware of the needed actions and, then, on promoting specific activities to address such needs. During 2004, the work carried out focused on identifying the gaps in BMI training. This was done by defining the ingredients that an “ideal” BMI curriculum should incorporate and then, comparing this “ideal situation” *versus* the current status of BMI training in Europe. In order to help analyse the existing situation of BMI training, a course database has been created, which incorporates a specific, newly created training topic thesaurus.

The result of this comparison (ideal *versus* real situation) should serve to identify the existing gaps in BMI training, and will allow for the promotion of newly developed training activities or the adaptation of existing ones, to better suit the educational needs of the future BMI researchers.

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## 4.2. Mobility objectives


The mobility action plan is aimed at having an integrative effect, consisting on promoting exchanges of scientists and experts among European organisations, from the Consortium and external to it, and belonging to the academia and the industry alike. These exchanges should take advantage of the complementarities and mutual specialisation of the participants. The host organisations and the participants' organisations will benefit from the newly acquired knowledge and gained experience of the participants.

The work carried out in 2004 focused on gathering the mobility needs and expectations of BMI scientists and technicians, through the means of a survey. The analysis of the survey results provided the sufficient information to propose an action plan for mobility to be deployed from 2005, which will consist essentially in the set up and maintenance of a mobility brokerage service (MBS).

The INFOBIOMED mobility action plan intends to set up a virtual marketplace, named MBS, promoting exchanges to occur. It should ensure that the researchers exchanges cover all the possible scenarios, meaning that BI specialists exchange with MI experts, and professionals from health organisations, such as hospitals, get to know better the academia or the industrial environments and vice versa. Moreover, these exchanges should also involve scientists who are neither bioinformaticians nor MI experts, but whose research could benefit from a BMI approach. It is obvious that BI-BI exchanges and MI-MI exchanges will occur, but the real interest of the mobility action plan is to promote BI-MI exchanges, in order to achieve a greater degree of integration between both disciplines.

## 5. OVERVIEW OF THE WORK CARRIED OUT IN 2004

The WP3 activities were initially scheduled to start in month 6 of the network (June 2004). However, it was decided by the Consortium in the kick-off meeting that, in view of the objectives settled, it would be preferable to advance the initial date of this WP by month 4 (April 2004). The

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reason behind it was to have enough time to carry out the preliminary work considered necessary to produce a comprehensive action plan in training and mobility by December 2004.

The first steps taken were the creation of a Training and Mobility Committee, which was already foreseen in the proposal and in Annex I – Description of Work of the EC contract and, subsequently, the outlining and approval of a workplan for 2004, leading to the action plan for Years 2 and 3 that will be described in detail in the following chapters of this document.

### 5.1. Work carried out

The work to be carried out during 2004 was foreseen as the preparatory work needed to tackle the Training and Mobility Action Plan that is presented in this deliverable. Therefore, this first year has focused on the investigation and analysis of the current status of training and mobility activities in BMI as well as in the detection of the needs and expectations of the main target groups with respect to both activities.

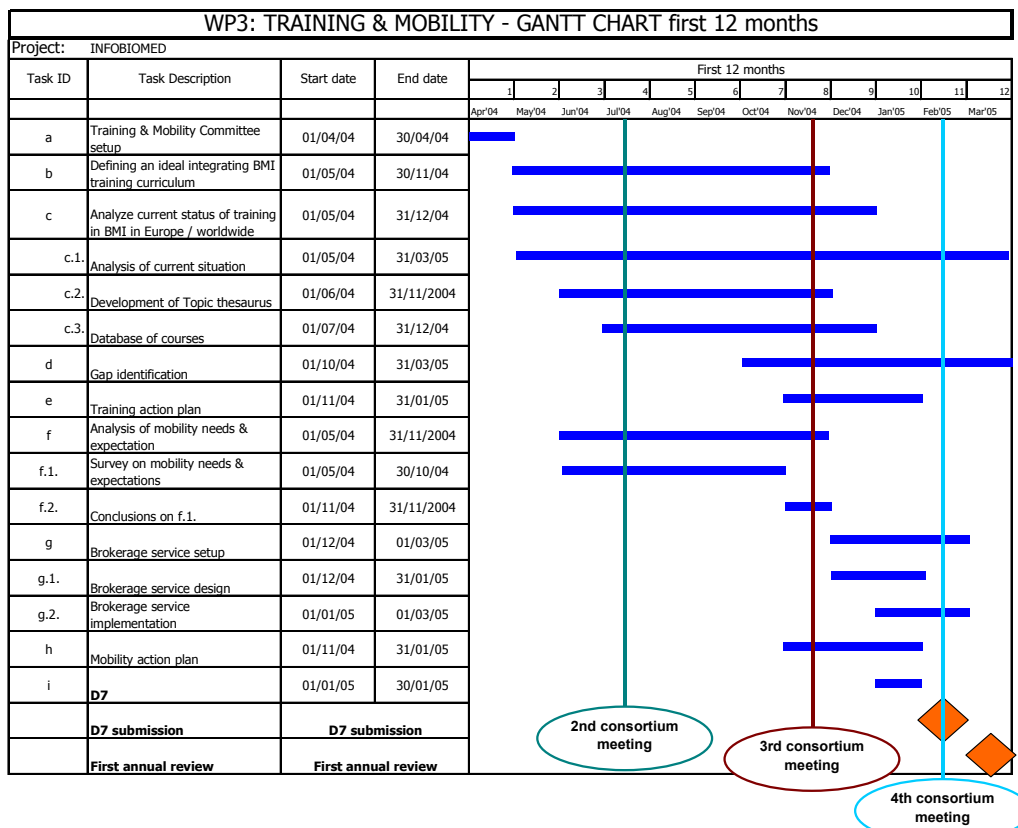



Figure 1: workplan overview for the first 12 months of activity

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## 5.2. The Training and Mobility Committee


A Training and Mobility Committee (TMC) was created at the beginning of the WP activities, constituted by the core group of partners involved in the strategy definition and execution of the activities related to training and mobility. It is understood that WP3 needs, by definition, the participation of all INFOBIOMED partners and, even more, it should aim at spreading beyond the NoE's boundaries. However, in order to efficiently manage the work to be carried out, it was decided to establish the TMC, constituted by a group of partners that will be specially proactive and dedicated to this WP.

A call for TMC members was published among the INFOBIOMED partners at the beginning of April 2004. The TMC is currently constituted by the following partners and representatives:

PARTNER ACRONYM	ROLE	PARTICIPANTS
IMIM	WP Leader	E Molero, J Villà
MI-EMC	Activity Leader (Training)	M Weeber, J van der Lei
UPM	Activity Leader (Mobility)	V Maojo, G de la Calle
ISCH	Participant	F Martín, V López
UAVR	Participant	A Sousa

Figure 2: TMC members

After the creation of the TMC, a WP3 kick-off meeting was celebrated in Barcelona in the 2<sup>nd</sup> of June 2004. The main outcomes of this meeting were the set up of the first 12 months of activity

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work plan, the assignment of responsibilities among TMC members and the agreement on the details of the first activities to be tackled within this WP.

RESPONSIBILITY CODES R = RESPONSIBLE I = PROVIDES INPUT W = DOES THE WORK A = APPROVES			MASTER WORKSHEET - WP3 - TRAINING AND MOBILITY															
Task ID	TASK DESCRIPTION	Predecessors	Project partners															
			FIMIM	IMIM	ISCIH	KI	UEDIN	CUSTODIX	UPM	UAVR	FORTH	FUNEN	INFORMA	HHUD	ERASMUS	HNPCC	ACTA	AZ
a	Training & Mobility Committee setup	-	-	R, W, A	I	I	I	I	I	I	I	I	I	I	I	I	I	I
b	Defining an ideal integrating BMI training curriculum	a	I	W, A	I	I	I	I	I, A	I	I	I	I	I	R, W, A	I	I	I
c	Analyze current status of training in BMI in Europe / worldwide	a	I	A, W	W	I	I	I	I, A	I	I	I	I	I	R, W, A	I	I	I
c.1.	Analysis of current situation	a	I	W, A	W	I	I	I	I, A	I	I	I	I	I	R, W, A	I	I	I
c.2.	Development of Topic thesaurus	a	I	W, A	W	I	I	I	I, A	I	I	I	I	I	R, W, A	I	I	I
c.3.	Database of courses	a	I	A, W	W	I	I	I	I, A	I	I	I	I	I	R, W, A	I	I	I
d	Gap identification	a,b,c	I	W, A	I	I	I	I	I, A	I	I	I	I	I	R, W, A	I	I	I
e	Training action plan	a,b,c,d	I	W, A	I	I	I	I	W, A	I	I	I	I	I	R, W, A	I	I	I
f	Analysis of mobility needs & expectation	a	I	A, W	I	I	I	I	R, W, A	I	I	I	I	I	I, A	I	I	I
f.1.	Survey on mobility needs & expectations	a	I	A, W	I	I	I	I	R, W, A	I	I	I	I	I	I, A	I	I	I
f.2.	Conclusions on f.1.	a, f.1.	I	A, W	I	I	I	I	R, W, A	I	I	I	I	I	I, A	I	I	I
g	Brokerage service setup	a,f	I	A, W	W	I	I	I	R, W, A	I	I	I	I	I	I, A	I	I	I
g.1.	Brokerage service design	a,f	I	A, W	W	I	I	I	R, W, A	I	I	I	I	I	I, A	I	I	I
g.2.	Brokerage service implementation	a,f,g.1.	I	A, W	W	I	I	I	R, W, A	I	I	I	I	I	I, A	I	I	I
h	Mobility action plan	a,f,g	I	A, W	I	I	I	I	R, W, A	I	I	I	I	I	W, A	I	I	I
i	<b>D7</b>	e,h	I	R, W, A	I	I	I	I	W, A	I	I	I	I	I	W, A	I	I	I

Figure 3: Responsibility assignment among INFOBIOMED partners

## 6. TRAINING ACTION PLAN

The tasks that have been tackled during the first year of the network with respect to training are addressed, on the one side, to gather the necessary knowledge to draw an accurate picture of the current situation of training in BMI in Europe and, on the other side, to elaborate on what should be the main components of an ideal curriculum in BMI. The result of both tasks has been essential to propose a well targeted action plan for the second and third year of the network.

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## 6.1. Work carried out in year 1

### 6.1.1. Ideal integrative training curriculum in Biomedical Informatics

One of the key objectives of the INFOBIOMED network of excellence is to enable a robust framework for education in Biomedical Informatics (BMI), as well as training and mobility of involved researchers that allows for the creation of a solid European BMI research capacity.

Fostering a new generation of scientists that speak both languages entails:


- Including BI in training programs of health centres and medical schools.
- Creating large multidisciplinary project teams to study complex diseases on different levels using genomics, proteomics, and clinical and other research approaches.
- Seeking active cooperation and involvement of industry.

The TMC views BMI as an interdisciplinary field, combining basic informational and computational sciences with application domains, including health care and biological research. In this approach, the TMC has taken as a reference the **American College of Medical Informatics Study**<sup>1</sup>. Its vision on how to reach a fully integrated and effective BMI training consists of four key elements:

1. Curricula that integrate experiences in the computational sciences and application domains rather than just concatenating them;

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<sup>1</sup> Friedman CP, Altman RB, Kohane IS, McCormick KA, Miller PL, Ozbolt JG, Shortliffe EH, Stormo GD, Szczepaniak MC, Tuck D, Williamson J. Training the Next Generation of Informaticians: The Impact of BISTI and Bioinformatics – A report from the American College of Medical Informatics. J Am Med Inform Assoc. 2004. 11(3):167-72.

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2. Diversity among trainees, with individualized, interdisciplinary cross-training allowing each trainee to develop key competencies that he or she does not initially possess;
3. Direct immersion in research and development activities;
4. Exposure across the wide range of basic informational and computational sciences.

During the third Consortium meeting celebrated in Barcelona in November 2004, the first meeting of the **INFOBIOMED Scientific Advisory Board**<sup>2</sup> (SAB) was held. Part of the meeting was dedicated to hear the vision of the board members on the future training of biomedical informatics professionals. It was acknowledged by the SAB that getting the right persons and transform them into full BMI specialists is daunting and not easy to obtain. The problem is that one would prefer someone who has a passion for the three following aspects:


- Taking care of people (Medicine)
- Winning the Nobel prize (Science)
- Technology (Informatics)

People with two out of three of these passions is already rare. One should encourage students to follow two or more streams simultaneously while not ignoring the fact people may, in the end, select only one stream: become a fine doctor, a brilliant scientist or a technology scientist

There are probably two ways out of this situation. First, experience from the board shows that it is best to attract the right people as early in their academic career as possible. Only then it is possible to train them along several disciplines and to let them integrate the diverse knowledge. A joint degree at the undergraduate level should be encouraged.

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<sup>2</sup> Members of the INFOBIOMED Scientific Advisory Board attending the meeting: Jan H. van Bommel (Erasmus University), Graham Cameron (European Bioinformatics Institute), James Fickett (Schering AG), Roderic Guigó (GRIB – Municipal Institute for Medical Research), Casimir Kulikowski (Rutgers, The State University of New Jersey) and Ana Tramontano (University of Rome "La Sapienza").

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A second way out, probably to be realized in a relatively short period, is to design collaborative efforts for medical doctors, medical informaticians, biologists, and bioinformaticians, early in their respective education. In an integrated BMI world, these professionals will have to interact on a daily basis to advance both basic research and patient care.

### **6.1.2. INFOBIOMED Training Topic Thesaurus<sup>3 4</sup>**


One of the goals of the *Training and Mobility* work package is to set up a comprehensive database of academic courses on BMI and related MI and BI courses. This database should first include information on the current academic programs of the Network partners, however, it has also the future goal of becoming the one-stop repository for European BMI training information. To reach this goal, we have decided to use state of the art Information Retrieval (IR) methodology to easily access and administer the course database. After an introduction of the employed IR model and tools, we describe the construction of a novel BMI training topic thesaurus that will be the core of the database of training courses. The first version of the thesaurus, which will be periodically updated, is attached as Annex A.

### **Information Retrieval**

**Use of Thesauri.** The use of the INFOBIOMED Course Database (ICD) is a typical IR one. A prospective user would like to see a biomedical informatics training need to be satisfied with a list of appropriate courses. Typical IR search engines use keywords from the user's query to look for these words in the course descriptions. Boolean searching with keywords combined with AND and OR (Google, PubMed) is the *de facto* standard and is powerful if one knows the right keywords. However, in an educational setting in which prospective students will not yet have a good overview

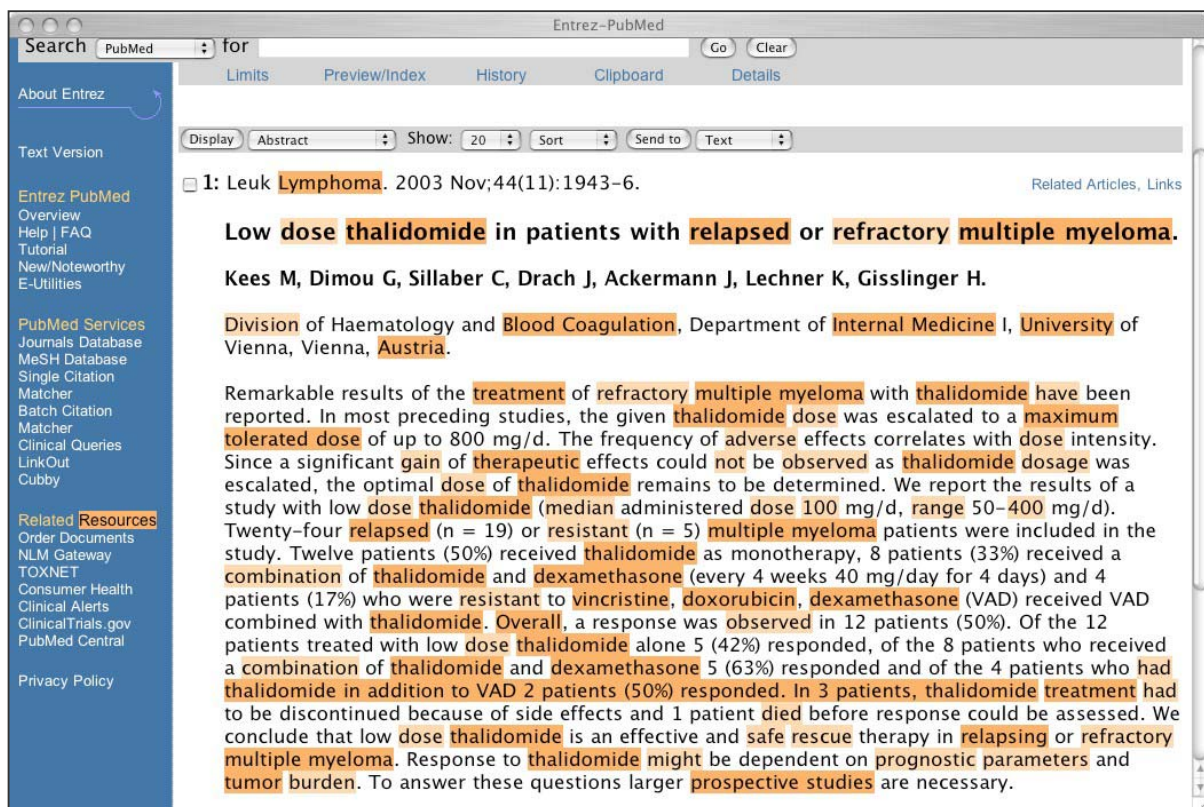
<sup>3</sup> Van Mulligen EM, Diwersy M, Schmidt M, Buurman H, Mons B (2000). Facilitating networks of information. *Proc AMIA Symp. 2000*: 868-72.

<sup>4</sup> Van Mulligen E, Diwersy M, Schijvenaars B, Weeber M, Van Der Eijk C, Jelier R, Schuemie M, Kors J, Mons B (2004). Contextual annotation of web pages for interactive browsing. *Medinfo 2004*: 94-8.

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of the subject, they will lack the right vocabulary. A concept rather than a keyword-based approach may improve the usability of the course database. For instance, a query using the term *side effects* should result, among others, in a list of records that include the term *adverse drug reactions*. These terms refer to one concept, after all. Similarly, *Prostate Specific Antigen (PSA)* and *Kallikrein 3 (KLK3)* denote one particular human gene.

In the biomedical sciences, many conceptual entities can be referred to by a multitude of terms (genes are notorious) and it comes therefore as no surprise that thesaurus development has a long history in the life sciences. In the figure below, a PubMed abstract is shown in which only the biomedical relevant concepts are highlighted. This concept recognition and highlighting process has been done automatically and on the fly (Van Mulligen *et al*, 2004).



The image shows a screenshot of a PubMed search result page. The search bar at the top contains the text "Search PubMed for" and "Go Clear". Below the search bar, there are tabs for "Limits", "Preview/Index", "History", "Clipboard", and "Details". The main content area displays a search result for "Leuk Lymphoma. 2003 Nov;44(11):1943-6." with a "Display" dropdown set to "Abstract" and "Show: 20" items. The abstract title is "Low dose thalidomide in patients with relapsed or refractory multiple myeloma." by Kees M, Dimou G, Sillaber C, Drach J, Ackermann J, Lechner K, Gisslinger H. The abstract text is highlighted in orange, showing terms like "treatment of refractory multiple myeloma with thalidomide", "maximum tolerated dose", "therapeutic effects", "thalidomide dosage", "relapsed or resistant multiple myeloma", "thalidomide", "dexamethasone", "vincristine, doxorubicin, dexamethasone (VAD)", "thalidomide treatment", "thalidomide", "relapsing or refractory multiple myeloma", "thalidomide", and "prognostic parameters and tumor burden".

Figure 4: Example of relevant concepts highlighted

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**The Vector Space Model.** Boolean searches are characterized by the hit or miss phenomenon. If a query consists of three keywords combined with AND, then all three keywords have to be found a database record to warrant a hit. In the educational context of the intended course database this is not favourable as in many cases students will not exactly know what they are looking for. Furthermore, if more than one hit is found in the database, the Boolean paradigm has no direct way of rank ordering the resulting hits as all hits have satisfied the Boolean requirements. A vector-based approach in which both query and database entries are represented by a vector of keywords or concepts remedies both drawbacks of typical Boolean searching. If a database record comprises two of the three query keywords (or concepts), it will still be found, however, it will have a lower relevance score compared to database records comprising all three query concepts.

The figure below shows a 3D example of this vector space model. Each document includes a maximum of 3 concepts. The weights per concepts are different, and that is reflected by different x,y, and z coordinates. In this way, each document is a three dimensional vector. A query can also be represented by a vector in this 3D space. The angle between the query vector and each document vector then represents the similarity of a document to the query. In the figure, the document D2 vector has the smallest angle,  $\alpha$ , to the query vector and this is interpreted as that D2 is the best hit for the query.

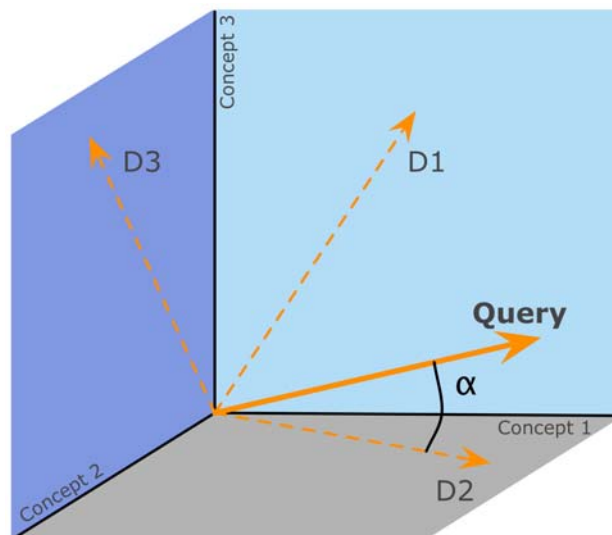



Figure 5: Representation of the vector space model

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**Collexis Indexing and Retrieval.** Based on the characteristics mentioned above, we have opted for a thesaurus-based, vector space Information Retrieval model for the INFOBIOMED Course Database. This model is implemented using Collexis<sup>®</sup> (Van Mulligen *et al*, 2000, and <http://www.collexis.com>) indexing and retrieval software. The Collexis indexer uses a thesaurus to identify the concepts and assign a relevance weight to each concept, based, among others, on term frequency, in both course descriptions and user queries. The set of concepts found in a text with their associated relevance weight is called a *fingerprint*. An example of a fingerprint is shown below. When all documents and the query have been transformed to fingerprints, searching is then viewed as matching the query fingerprint to the database fingerprints. The closest match makes the most relevant hit to a query.

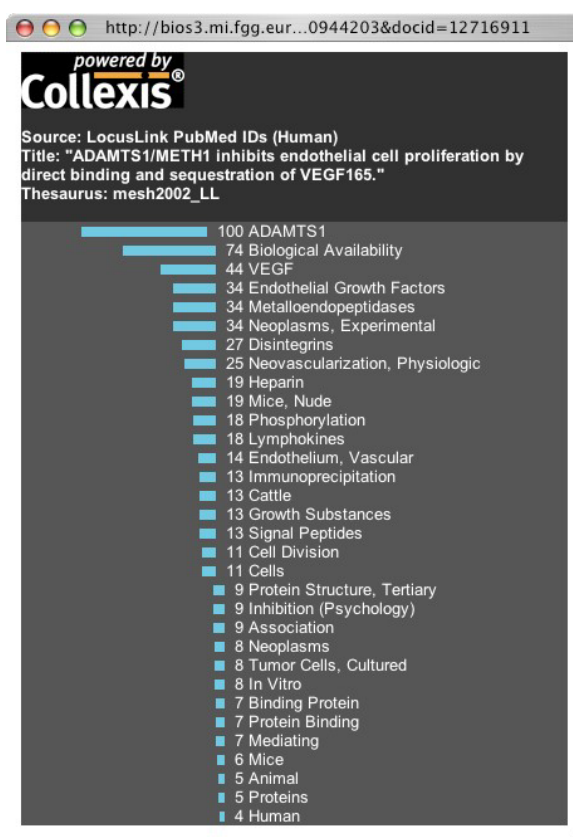



Figure 6: Example of fingerprint


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Key to the success of thesaurus-based IR is the use of adequate thesauri. For the purpose of the INFOBIOMED Course Database, we will use the standard biomedical MeSH (Medical Subject Headings) thesaurus from the National Library of Medicine (NLM). However, this thesaurus only covers the subject area of Biomedical Informatics in part. We have therefore decided to create a novel thesaurus to cover the diverse training topics regarding the relevant scientific areas of INFOBIOMED.

### Construction of the INFOBIOMED Training Topic Thesaurus

**History.** The plan of compiling a specific training topic thesaurus originated at the first meeting of the TMC meeting in Barcelona, June 2004. A first version was presented at the second Consortium meeting (Edinburgh, July 2004), and was extensively modified after feedback from several TMC members. The first operational version was presented at the third Consortium meeting (Barcelona, November 2004), together with a prototype of the INFOBIOMED Course Database (ICD). This version of the thesaurus is included as Annex A to this deliverable.

**Structure of Thesaurus.** The scientific areas involved in biomedical informatics in general, and the INFOBIOMED Network of Excellence in particular, are depicted below. We believe that this structure should be reflected in the training topic thesaurus.

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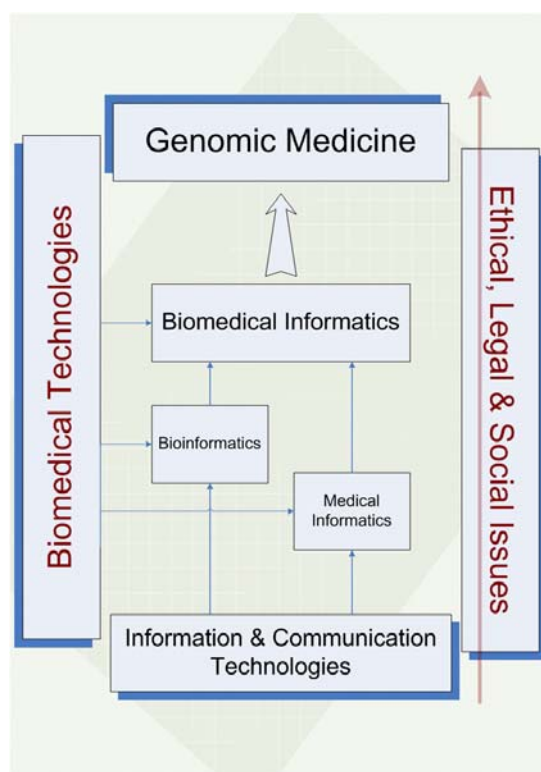



Figure 7: Scientific areas involved in BMI

Very briefly, at the base of the whole scheme we have I&C Technologies, which support MI and BI and have facilitated the synergy between both to give rise to BMI. Biomedical technologies applied to the specific fields have contributed to these three areas. The aim of all the architecture is Genomic Medicine, and everything is under strict ethical, legal, and social issues (ELSI).

With this framework in mind we propose the following thesaurus structure, based on the seven main areas:

1. Ethical, Legal and Social Issues
2. Information and Communication Technologies
3. Bioinformatics
4. Medical Informatics

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5. Biomedical Technologies
6. Biomedical Informatics
7. Biomedicine

For each of these seven main categories of concepts, there are one or more subcategories. For instance, *Security* is a subcategory of the Ethical, Legal, and Social Issues main category; *Information Retrieval and Digital Libraries* is a subcategory of Information and Communication Technologies main category. For a full overview of subcategories we refer to the Annex A.

The proposed topic thesaurus is not a thesaurus in a strict sense in that a thesaurus unit comprises more than a single conceptual entity. For instance, *Confidentiality*, *Data Protection*, and *Authentication* are all “synonyms” of the subcategory Security. Of course, these are no linguistic synonyms, and can be better regarded as “trigger words” that should trigger the subcategory it belongs to. Similarly, if the terms *Health Informatics*, *Health Management Informatics*, *Primary Care Informatics*, or *Nursing Informatics* appear in a course description or query, the Collexis indexing software should report the main category Medical Informatics as an appropriate index term for that specific course.

### **6.1.3. Creation of the INFOBIOMED Course Database (ICD)**

One of the goals of the Training and Mobility work package is to set up a comprehensive database of academic courses on BMI and related MI and BI courses. This database should first include information on the current academic programs of the network partners, however, it has also the future goal of becoming the one-stop repository for European BMI training information. To reach this goal, we have decided to use state of the art Information Retrieval (IR) methodology to easily access and administer the course database. This section describes the implementation of the ICD database. We refer to the topic thesaurus construction for a more general background on thesaurus-based vector space IR. It must be acknowledged as a source of inspiration the health training directory located at <http://www.healthtraining.org/>.


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## Implementation of Metadata

- *Country:* Initially, the EU, but global in a later phase.
- *Institute:* Initially, all network partners.
- *Degree:* Standard degrees.
- *Duration:* Starting from one week.
- *Method:* Method of training; lab, group, individual, classroom.
- *Type:* Single course or a program of courses (e.g., a full BMI master's).
- *Examination:* How the participant will be tested.

## Typical Usage

**From a user's perspective.** The user can best start with a description of his interest. Of course, just keywords can be entered as well, or the user can skip the textual input at all. In the figure below, a description of interest is entered:


**Search Courses** 

Your search would benefit from an extensive description of your search query. Copy and paste, for instance, some of the abstracts you have written. Or enter a URL of a web page that is relevant to your specific area of interest:

Orphan diseases are rare diseases. As there are many orphan diseases, an estimated 1 in every 10 individuals is afflicted with an orphan disease. The development of treatments for orphan diseases has been hampered by a lack of interest from academia and industry. Recent European and national (Steering Committee Orphan Drugs) initiatives stimulate R&D and marketing for novel orphan disease treatments. Recently, I have shown that the systematic analysis of the biomedical scientific literature may result in generating novel potential indications for existing drugs. For instance, I argued that thalidomide might be used for treating the orphan disease myasthenia gravis.

In the current proposal I aim to integrate (pharmacogenomic) knowledge represented in curated and validated biological databases into highly innovative text-based meta-analysis tools in order to find new treatments for orphan diseases by uncovering mechanistic pathways. Using powerful thesaurus-based text mining and meta-analysis technology, I hope to find interesting associations between orphan diseases and potentially novel treatments. These treatments include existing drugs and chemicals or known biomolecules. New methodology will be developed to extract knowledge on hypothetical pathways from the literature for the found associations. Combining the extracted knowledge with curated biological databases, highly specific and testable hypothetical pathways between orphan disease and potential treatment will be formulated.

Figure 8: Scientific areas involved in BMI

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The next screen provides the list of keywords found in the user’s input text. Also, the user can select additional keywords, or unselect automatically selected ones. For the input text above, the following keywords are selected:

<input type="checkbox"/> Biomedical Informatics <input type="checkbox"/> Biomedical databases <input type="checkbox"/> Clinical and genetic databases integration <input type="checkbox"/> Clinical genomics <input type="checkbox"/> Disease oriented informatics <input type="checkbox"/> Disease-gene association studies <input type="checkbox"/> Genomic epidemiology <input type="checkbox"/> Integration of genetic data in medical standards <input type="checkbox"/> Modelling and simulation <input type="checkbox"/> Molecular and functional imaging <input type="checkbox"/> Phenome project <input checked="" type="checkbox"/> Terminologies <input checked="" type="checkbox"/> Text mining <input type="checkbox"/> Tumour databases <input type="checkbox"/> e-learning and CME for genomic medicine	<input type="checkbox"/> Biomedical technologies <input type="checkbox"/> Biochips <input type="checkbox"/> Clinical diagnosis <input type="checkbox"/> Nanotechnology	<input type="checkbox"/> Biomedicine <input type="checkbox"/> Cancer <input type="checkbox"/> Cardiovascular diseases <input type="checkbox"/> Dental diseases <input type="checkbox"/> Epidemiology and public health <input type="checkbox"/> Genomic epidemiology <input type="checkbox"/> Genomic medicine <input type="checkbox"/> Medical genetics <input type="checkbox"/> Microbial genomics <input type="checkbox"/> Neurodegenerative diseases <input type="checkbox"/> Pharmacogenomics <input checked="" type="checkbox"/> Rare diseases
<input type="checkbox"/> Information and Communication Technologies <input type="checkbox"/> Algorithms <input type="checkbox"/> Artificial intelligence <input type="checkbox"/> Biocomputing <input type="checkbox"/> Biostatistics <input type="checkbox"/> Communication networks <input type="checkbox"/> Data mining and data visualization <input checked="" type="checkbox"/> Databases <input type="checkbox"/> Hardware and software <input type="checkbox"/> Information retrieval and digital libraries <input type="checkbox"/> Interfaces and Operating systems <input type="checkbox"/> Knowledge management <input type="checkbox"/> Semantic web <input type="checkbox"/> Standards in data interchange	<input type="checkbox"/> Medical Informatics <input type="checkbox"/> Clinical trials <input type="checkbox"/> Decision making support <input type="checkbox"/> Electronic health records <input type="checkbox"/> Health information systems <input type="checkbox"/> Informatics in public health and epidemiology <input type="checkbox"/> MI Standards <input type="checkbox"/> Medical imaging <input type="checkbox"/> Outcomes research <input type="checkbox"/> Telemedicine	

Figure 9: Screenshot of the ICD

Using only a few optional filters (a program at master’s level), see figure below,

**Optional Filters:**

Country:

Institute:

Degree:


Duration:

Method:

Type:

Examination:

Figure 10: Screenshot of the ICD

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provides a rank-ordered list of master programs that might be relevant to the user's interest. Each of the courses is clickable and there are also references to the original web site of the course description.




Figure 11: Screenshot of the ICD

**From an administrator's perspective.** The administrator or course or program supervisor can either update or enter new courses and programs. The easiest way is to submit a URL to a course description or copy and paste such a description from another document. See below for the URL example:




Figure 12: Screenshot of the ICD

The next step is to enter metadata. The course title and contact email have to be entered by hand. The other metadata are optional, and there is a (growing) list of options per metadata item. For

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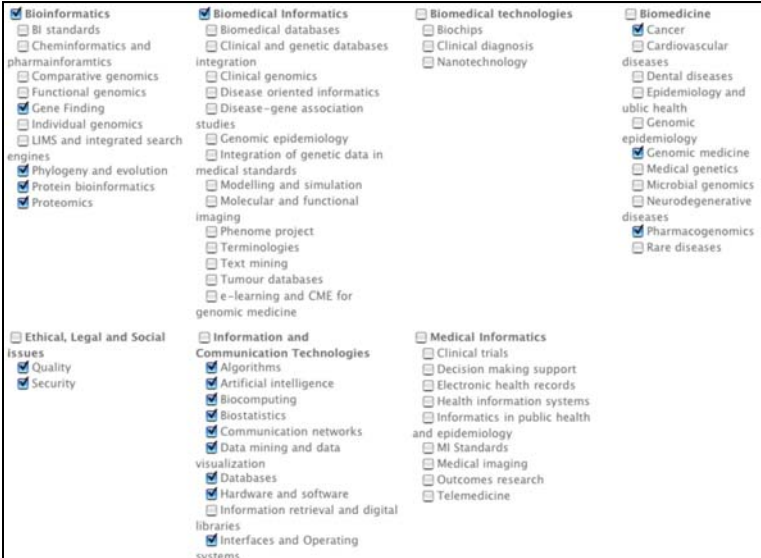
instance, all Network partners are included in the “Institute” item, but the administrator can fill in any other name (in the “or other” field).



Course title: MSc Bioinformatics for Health Sciences  
 Course URL: http://www.upf.edu/idec/oferta/mbio\_prog.htm  
 Contact email: jvilla@imim.es  
 Country: Spain or other:  
 Institute: Barcelona: Municipal Medical Research Institute or other:  
 Degree: Master or other:  
 Duration: Year or other:  
 Method: Theory and practice or other:  
 Type: Program or other:  
 Examination: - or other:


Figure 13: Screenshot of the ICD

The final step is to check the keywords that are automatically found. For the program description in this example, the relevant keywords are selected below. The administrator can select or unselect any other keyword as well.



- Bioinformatics
  - BI standards
  - Cheminformatics and pharminformatics
  - Comparative genomics
  - Functional genomics
  - Gene Finding
  - Individual genomics
  - LIMS and integrated search engines
  - Phylogeny and evolution
  - Protein bioinformatics
  - Proteomics
- Ethical, Legal and Social issues
  - Quality
  - Security
- Biomedical Informatics
  - Biomedical databases
  - Clinical and genetic databases integration
  - Clinical genomics
  - Disease oriented informatics
  - Disease-gene association studies
  - Genomic epidemiology
  - Integration of genetic data in medical standards
  - Modelling and simulation
  - Molecular and functional imaging
  - Phenome project
  - Terminologies
  - Text mining
  - Tumour databases
  - e-learning and CME for genomic medicine
- Information and Communication Technologies
  - Algorithms
  - Artificial intelligence
  - Biocomputing
  - Biostatistics
  - Communication networks
  - Data mining and data visualization
  - Databases
  - Hardware and software
  - Information retrieval and digital libraries
  - Interfaces and Operating systems
- Biomedical technologies
  - Biochips
  - Clinical diagnosis
  - Nanotechnology
- Medical Informatics
  - Clinical trials
  - Decision making support
  - Electronic health records
  - Health information systems
  - Informatics in public health and epidemiology
  - MI Standards
  - Medical imaging
  - Outcomes research
  - Telemedicine
- Biomedicine
  - Cancer
  - Cardiovascular diseases
  - Dental diseases
  - Epidemiology and public health
  - Genomic epidemiology
  - Genomic medicine
  - Medical genetics
  - Microbial genomics
  - Neurodegenerative diseases
  - Pharmacogenomics
  - Rare diseases

Figure 14: Screenshot of the ICD

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Once the administrator is satisfied with the metadata and the keywords, the course is put into the database and he can view the entry from the database:



The screenshot shows a web interface titled "Search Courses" with the INFOBIOMED logo in the top right. Below the title are three buttons: "Home", "Search", and "Entry". The main content area displays the following information for the course "MSc Bioinformatics for Health Sciences":


- URL:** [http://www.upf.edu/idec/oferta/mbio\\_prog.htm](http://www.upf.edu/idec/oferta/mbio_prog.htm)
- Email:** [jvilla@imim.es](mailto:jvilla@imim.es)
- Keywords:**
  - Algorithms
  - Artificial intelligence
  - Biocomputing
  - Bioinformatics
  - Biomedical Informatics
  - Biostatistics
  - Cancer
  - Communication networks
  - Data mining and data visualization
  - Databases
  - Gene Finding
  - Genomic medicine
  - Hardware and software
  - Interfaces and Operating systems
  - Pharmacogenomics
  - Phylogeny and evolution
  - Protein bioinformatics
  - Proteomics
  - Quality
  - Security
- Country:** Spain
- Institute:** Barcelona: Municipal Medical Research Institute
- Degree:** Master
- Duration:** Year
- Method:** Theory and practice
- Type:** Program

Figure 15: Screenshot of the ICD

Currently, the database model has been defined, and a general search and entry web interface have been developed. The administrator authentication procedure still has to be implemented, so that only course and program co-ordinators are able to expand and change the contents of the database. It still has to be discussed how stringent this process has to be.

## 6.2. Workplan in years 2 and 3

The tasks developed until December 2004 have served as preparatory work to gather the needed information and to build the basic tools to decide and start implementing the current action plan. The proposed training action plan will be based in the activities explained below. It is foreseen, however, that the training action plan will be regularly updated and some of the activities that are presented below in a general manner will attain a greater level of detail as the discussions of the

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TMC advance. A formal update of the plan will be issued in month 24, and quarterly internal reviews are foreseen. In this future deliverable, an evaluation of the activities carried out so far will be done (using the measuring criteria established in the Annex I of the EC contract) and the activities to be tackled in the third year will be further detailed.


### **6.2.1. Publication and exploitation of the INFOBIOMED Course Database (ICD)**

Once the ICD has been set up, it will be published in the Internet, which is foreseen by month 15 (March 2005). The ICD will be accessed through the INFOBIOMED website and will be open to any organisation willing to introduce its training activities. Initially, the focus will be on integrative BMI courses and programs, however, BI and MI courses can be included as well. A first discussion among network partners showed a preference for a more inclusive than restrictive attitude.

Not only the ICD will be published, but its features and availability will be disseminated proactively. The ICD will be a useful tool as long as it is used, first of all by the organisations to entry their courses, and then by the users to perform searches through it. It is to be noted that, upon publication, the ICD will contain only the training activities organized and/or recommended by the INFOBIOMED partners. Therefore, the objective of the ICD dissemination campaign will be to create awareness among organizations and users in order to get them to introduce the existing courses and to use the ICD to search for training events. In order to efficiently communicate the ICD, several actions will be decided: scientific distribution lists, news articles, specific press release, etc. The exploitation of the ICD will be an ongoing activity, starting in month 16 (April 2005).

### **6.2.2. Analysis of current situation: Gap identification**

The work carried out during the first year has been designed so as to gather the necessary information to allow the TMC to identify the current existing gaps in training in BMI, and to subsequently address those gaps with an *ad hoc* action plan. Indeed, the purpose of the activities of defining an ideal curriculum and the building of a database containing the existing training

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activities is to allow the comparison of the “ideal” situation versus the “reality”. Although this comparison activity has already started in the first year, the conclusions will be collected in a document during the first semester of 2005.

The outcome of this task will be a white paper summarizing the status of BMI training in Europe and describing the identified gaps that will be made publicly available through the INFOBIOMED website, and which will lead to the organisation of newly developed or adapted training activities.

### **6.2.3. Analysis of the implications of the Bologna criteria in BMI training**


The TMC is aware that any proposal aiming to shape the training in BMI at the European level should take into account the training and education policies that are being endorsed by the European Union. Therefore, a task will be devoted to monitoring the European education policies and how they might impact the training in BMI, so as to ensure that INFOBIOMED initiatives are consistent with European policies.

The European Community is committed to strengthen the so-called «European knowledge society». The main tool for putting this ambition into practice is the SOCRATES programme,<sup>5</sup> which contains an action specifically focused on Higher Education: SOCRATES/Erasmus.<sup>6</sup> This action supports and encourages exchanges of students and trainers, the launching of joint study programmes or intensive courses, pan-European thematic networks and other measures aiming at the development of a European dimension in higher education. In addition, e-learning<sup>7</sup> will be specially promoted by the Commission.

In 1999, 29 countries signed the so-called Bologna declaration, to build the European Space of Higher Education (ESHE), part of the effort for creating. This area should facilitate mobility of people, transparency and recognition of qualification, quality and European dimension in higher education, attractiveness of European institutions for third country students. The declaration has

<sup>5</sup>[http://europa.eu.int/comm/education/programmes/socrates/socrates\\_en.html](http://europa.eu.int/comm/education/programmes/socrates/socrates_en.html)

<sup>6</sup>[http://europa.eu.int/comm/education/programmes/socrates/erasmus/erasmus\\_en.html](http://europa.eu.int/comm/education/programmes/socrates/erasmus/erasmus_en.html)

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been adopted by new countries, and ministers responsible for higher education in 40 European countries will meet in Bergen (May 2005) to analyse the progress of the Bologna Process since the Berlin meeting (September 2003) and to set directions for the further development towards the European Higher Education Area to be obtained by 2010.<sup>8</sup>

It is thus clear that any proposal for graduate and postgraduate formal training in the field of Biomedical Informatics should be undertaken following the recommendations and the tools the ESHE. In particular, the paradigm for the postgraduate training in the area of BMI is the creation of master studies. One of the INFOBIOMED expected results is the definition of the ideal curriculum for this area (which has been explained in a previous section). From this description INFOBIOMED should be able to propose recommendations for the postgraduate programs within the NoE and in Europe in general, under the umbrella of the ESHE. One of the tools created by the Community that will have a big impact in the definition of European-wide programs is new Erasmus Mundus<sup>9</sup> programme, issued at the end of 2003.

As it is presented, the Erasmus Mundus programme is a “co-operation and mobility programme in the field of higher education. It aims to enhance quality in European higher education and to promote intercultural understanding through co-operation with third countries”. The programme aims are to strengthen European co-operation and international links in higher education by supporting high-quality European Masters Courses, by enabling students and visiting scholars from around the world to engage in postgraduate study at European universities, as well as by encouraging the outgoing mobility of European students and scholars towards third countries.

The Erasmus Mundus programme comprises four concrete actions:


- Action 1 - Erasmus Mundus Masters Courses. Involves the creation of “integrated” courses, in such a way that they must foresee a study period in at least two of the participant universities and that it must lead to the award of a recognised double, multiple or joint diploma.

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<sup>7</sup>[http://europa.eu.int/comm/education/programmes/elearning/index\\_en.html](http://europa.eu.int/comm/education/programmes/elearning/index_en.html)

<sup>8</sup><http://www.bologna-bergen2005.no>

<sup>9</sup>[http://europa.eu.int/comm/education/programmes/mundus/index\\_en.html](http://europa.eu.int/comm/education/programmes/mundus/index_en.html)

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- Action 2 - Erasmus Mundus scholarships for highly qualified individuals who come to Europe to participate in the courses.
- Action 3 – Partnerships with third-country higher education institutions to provide mobility to the students.
- Action 4 - Enhancing attractiveness to improve the profile, visibility and accessibility of European higher education.

During year 2005 the possibilities of linking the training efforts within the NoE with the ESHE, in particular the exploration of the applicability of the Erasmus Mundus in new masters degrees in the field of BMI will be explored.

#### **6.2.4. Conference about training in BMI**

A conference about training in BMI will be hosted by INFOBIOMED, with the objective of formulating specific proposals to improve training in this area, and how to bridge the gap between BI and MI by the use of training. This conference will be celebrated in April-May 2005 at one of the TMC members' sites, and will be open to the rest of INFOBIOMED partners and to a group of invited participants, representing the main stakeholders in training activities (academic organisations, scientists from academia and industry, etc.). This conference is conceived as a forum of discussion to elaborate and validate the findings and proposals of the INFOBIOMED Consortium. It is expected that the conclusions of this forum will serve to check the appropriateness of the specific training activities to be promoted by the NoE.

At the time of the conference, a TMC meeting will also be celebrated, to agree on the precise next steps to be taken by the TMC to implement the conclusions agreed.


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### **6.2.5. Newly developed and/or adapted training activities organisation**

It is foreseen that, in light of the results of the previous activities, training activities will be designed and promoted by INFOBIOMED. In some cases, the courses proposed will be new ones, and they will be organised, hosted or promoted by INFOBIOMED partners. In other cases, recommendations will be made to adapt the existing curricula to a more integrative approach that would foster BMI consolidation.

At the current stage, two kinds of newly developed activities are being considered by the TMC:

- **Training activities addressed to young students** in their first stages of graduate education. These courses would intend to reach a wide number of pre-graduate students, they would focus on introducing basic BMI concepts, and they would be in classic/traditional formats, like seminars or summer schools in BMI. The advantage of promoting this kind of activities is the widespread effect, as they can reach a relatively large number of people as well as the fact of being addressed to young students. It has been emphasized by the Scientific Advisory Board that, in order to have well trained BMI professionals in the future, with deep understanding of the BMI discipline, it is essential to start training them at an early stage of their education. Therefore, it is considered key by the Consortium to come up with specific training actions addressed to this target group.
  
- **Training activities addressed to scientists / professionals**, offering education opportunities in BMI to already trained people. These courses are thought to have an innovative, integrative format. Indeed, it has been observed that the current situation consists basically of students or scientists that do not have an integrative background, and therefore, it is in the interest of INFOBIOMED to promote this integration to happen. In the same way as the pilot applications developed in WP6 consist on dealing with a specific scientific issue in an integrated manner (putting together the knowledge and expertise of BI, MI and BMI scientists), the TMC proposes to apply this approach to the training activities addressed to postgraduate students and scientists. Following this philosophy, hands-on

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problem-based workshops would be organised or promoted by INFOBIOMED. For instance, these workshops would consist on gathering together a few biologists, medical doctors, medical informaticians and bioinformaticians and give them a specific problem that cannot easily be solved by a single disciplinary approach, and let them combine their expertise to advance their knowledge. This proposal has the advantage of being truly integrative. However, by its own nature, these workshops would probably reach a smaller audience (since the proposed activities would have to be carried out among a small group of people).


It is planned that the next TMC meeting will decide on the appropriateness of both approaches in view of the objectives that have been set.

#### **6.2.6. Quarterly review and analysis of results achieved**

The TMC will quarterly review and update the workplan, and will call for specific meetings to discuss and decide particular actions. Taking into account that Consortium meetings are organised on a quarterly basis, the TMC will organise internal meetings previous to the plenary sessions (face-to-face or virtual), in order to prepare the proposal to present to the Consortium. At least one specific TMC meeting per year will be celebrated (2<sup>nd</sup> of June 2004 was the first one and the second one is planned for April-May 2005).

### **7. MOBILITY ACTION PLAN**

As in the training activity, the tasks performed during the first year have served basically to collect the information needed to build the action plan for years 2 and 3, consisting essentially in the analysis of mobility needs and expectations through a comprehensive survey. After studying the survey results, a system to fund mobility initiatives within the network was proposed and approved by the Consortium. The survey results have also been the basis for the set up of the mobility brokerage service.

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## 7.1. Work carried out in year 1


### 7.1.1. Analysis of the mobility needs and expectations

The first step leading to the creation of the planned Mobility Brokerage Service (MBS) was the investigation of the needs and expectations regarding mobility among network partners and external scientists. For this reason, an ambitious survey aimed at identifying such aspects was designed, implemented and analysed during the first year. In addition, the survey gathered the opinions of respondents about what should be the main features of the MBS.

The initial step to design the survey was to agree on what would be considered “mobility” in the framework of INFOBIOMED. The following definition of mobility was agreed:

In the framework of INFOBIOMED, **mobility** is understood as “*any stay implying physical mobility of scientific/technical staff to the premises of a different host organization. It should have a minimum duration of one week and it should have the objective of carrying out scientific/technologic work*”.

Having set the objective of the survey as “*to establish the current mobility needs and expectations of the European Biomedical Informatics community*”, it was decided to set up 2 different surveys; **Mobility Survey A**, addressed to potential host organizations and **Mobility Survey B**, addressed to potential mobility candidates. Each survey was divided into two parts, a first part specific for either hosts or candidates and a second part, which was common for both surveys, addressed to collect information about the specific features that should be included in the **INFOBIOMED Mobility Brokerage Service (MBS)**.

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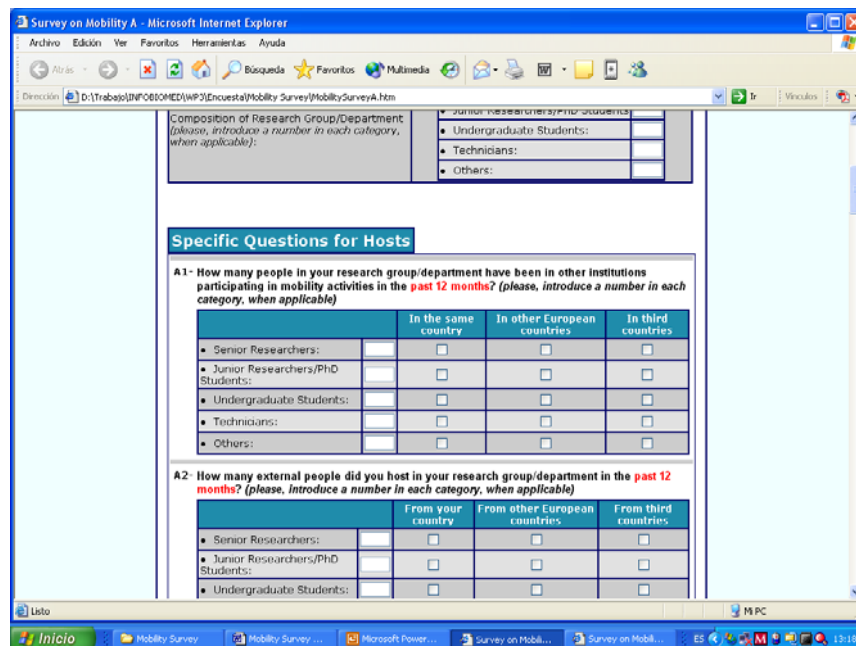
The **Mobility Brokerage Service (MBS)** is envisaged as a web-based marketplace where the following information will be made available to interested parties:

- Information on host organizations, offering mobility opportunities.
- Mobility opportunities (see mobility definition).
- Job offers.
- Candidate information (interested both in mobility and/or jobs).

The MBS is intended to automatically match offers and demands, apart from allowing access to the information posted. The MBS will be open to all organisations and candidates in the field of BMI.

### Survey format

The survey was web-based. The answers to the survey were automatically stored on electronic format for easier analysis. When a respondent filled and sent the survey, the answers were stored in the system and a receipt was returned by email.



The screenshot shows a web browser window titled "Survey on Mobility A - Microsoft Internet Explorer". The address bar shows the URL: "D:\Trabaja\INFOBIOMED\WP3\Encuesta\Mobility Survey\MobilitySurveyA.htm".

The main content area contains the following sections:


- Composition of Research Group/Department** (please, introduce a number in each category, when applicable):
 

• Junior Researchers/PhD Students:	
• Undergraduate Students:	
• Technicians:	
• Others:	
- Specific Questions for Hosts**
- A1- How many people in your research group/department have been in other institutions participating in mobility activities in the past 12 months? (please, introduce a number in each category, when applicable)**

	In the same country	In other European countries	In third countries
• Senior Researchers:	<input type="text"/>	<input type="text"/>	<input type="text"/>
• Junior Researchers/PhD Students:	<input type="text"/>	<input type="text"/>	<input type="text"/>
• Undergraduate Students:	<input type="text"/>	<input type="text"/>	<input type="text"/>
• Technicians:	<input type="text"/>	<input type="text"/>	<input type="text"/>
• Others:	<input type="text"/>	<input type="text"/>	<input type="text"/>
- A2- How many external people did you host in your research group/department in the past 12 months? (please, introduce a number in each category, when applicable)**

	From your country	From other European countries	From third countries
• Senior Researchers:	<input type="text"/>	<input type="text"/>	<input type="text"/>
• Junior Researchers/PhD Students:	<input type="text"/>	<input type="text"/>	<input type="text"/>
• Undergraduate Students:	<input type="text"/>	<input type="text"/>	<input type="text"/>

Figure 16: Screenshot of the Mobility Survey

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The survey was available on the web from the 2<sup>nd</sup> of September, until the 27<sup>th</sup> of October 2004. Each partner received a login and a password to access to the survey, and all respondents belonging or recruited by the same partner were using that partners' password, so that the survey administrator could check which partners had reached the target.

### Sample Selection


The population of reference was constituted by researchers or technicians working in the field of BMI in Europe.

**Mobility Survey A (for Host Organizations):** was answered by representatives of host organizations. The respondents were people empowered to accept mobility candidates in her/his research department or group. Each INFOBIOMED partner was asked to ensure that Survey A was answered by two representatives: at least, one representative of every INFOBIOMED partner on behalf of each organization and one representative of an external organization.

**Mobility Survey B (for Mobility Candidates):** every INFOBIOMED partner was asked to recruit at least four survey respondents belonging to the population of reference: at least one postgraduate student, one junior researchers and one senior researcher. Respondents could belong to an INFOBIOMED partner or to any external organization involved in Biomedical Informatics.

**Mobility Survey C (for the MBS):** every INFOBIOMED partner should recruit at least four survey respondents belonging to the population of reference. Respondents belonged to an INFOBIOMED partner or to any external organization involved in Biomedical Informatics.

Mobility Survey respondents A and B should also answer Mobility Survey C.

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## Sample Size

Mobility Survey A: n = 25 (minimum)

Mobility Surveys B and C: n = 60 (minimum)

## Survey results


For better understanding of the analysis done, the figures of the tables shown below have the following meaning:

- Numeric results or 1-5 scale answers are expressed as: Mean (SD) [n]
- Results for checkbox-type answers are expressed as: (No. checks/n) \*100 % [n], where “n” is the number of respondents to each question.

For more details on the survey results, the internal report produced, analysing the answers received question by question is attached as Annex to this deliverable.

## Mobility Survey A

The target size, 25 surveys completed, was reached, since a total of 30 surveys were submitted. There was a high participation from universities, which was not surprising, given the nature of the NoE.

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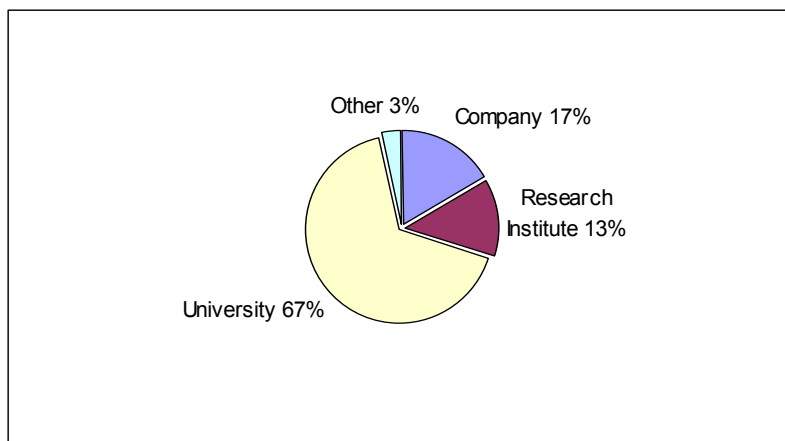


Figure 17: Respondent breakdown by institution type

The staff group that could be more benefited from participating in mobility activities was believed to be junior researchers/PhD students, followed by senior researchers.

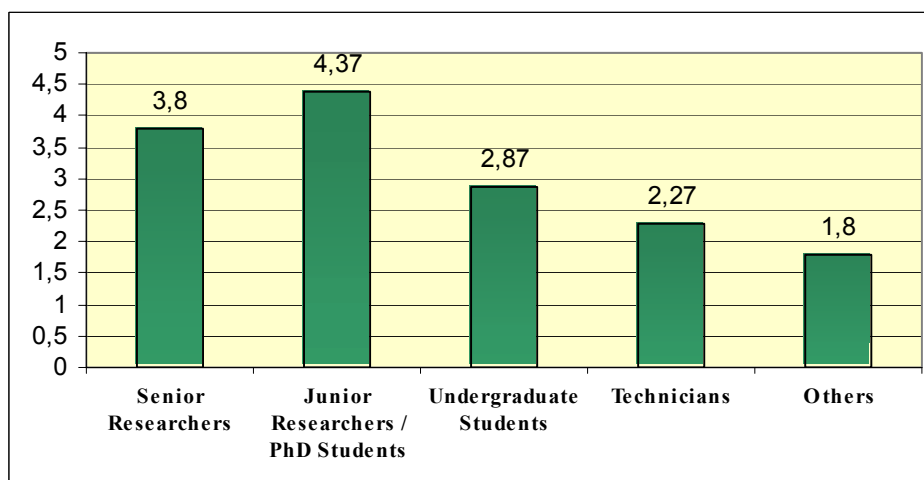



Figure 18: Staff that could be most benefited from mobility

The main identified barriers for hosting mobility activities would be in the first place lack of funding, followed at a significant distance by lack of time and lack of space. This information is of great importance when it comes to design specific mobility activities, since they should clearly address the main obstacles recognized.

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Barriers for hosting mobility activities	%
- Lack of space	43,33%
- Lack of time	53,33%
- Interference with current research in progress	16,67%
- <b>Lack of funding</b>	<b>90,00%</b>
- Lack of services (housing, etc)	16,67%
- Lack of administrative support	20,00%
- Other:	0,00%

Figure 19: Main barriers for hosting mobility candidates

## Mobility Survey B

The target sample was also reached for survey B (60 surveys submitted). It is to be remarked that representatives of 10 European countries answered the survey, although there was a relatively high number of respondents from Spain, due to the large number of INFOBIOMED partners that come from this country.

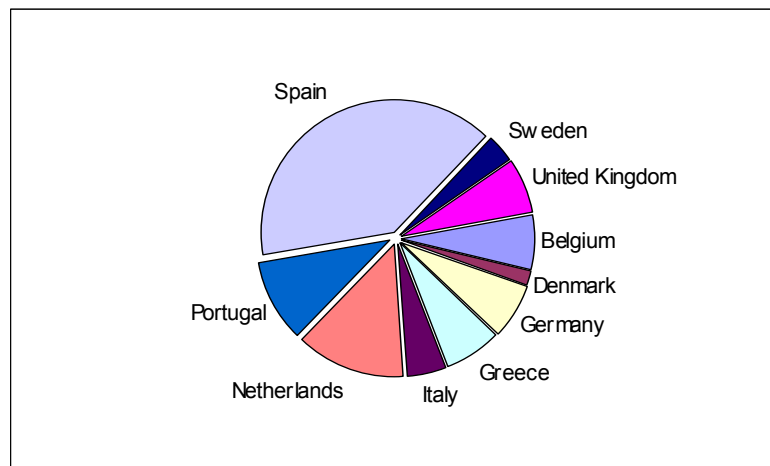



Figure 20: Respondent breakdown by country

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About the ideal duration of a mobility activity, the survey seems to confirm that the initial approach of the TMC was correct (from 2 weeks to 6 months), since it covers 70% of the answers.


Intervals	Surveys	%
x <= 1 week	7	11,67%
1 week < x <= 2 weeks	6	10,00%
<b>2 weeks &lt; x &lt;= 1 month</b>	<b>9</b>	<b>15,00%</b>
<b>1 month &lt; x &lt;= 2 months</b>	<b>9</b>	<b>15,00%</b>
<b>2 months &lt; x &lt;= 3 months</b>	<b>12</b>	<b>20,00%</b>
<b>3 months &lt; x &lt;= 6 months</b>	<b>12</b>	<b>20,00%</b>
6 months < x <= 1 year	4	6,67%
x > 1 year	1	1,67%
<b>Total:</b>	<b>60</b>	<b>100%</b>

Figure 21: Ideal duration of a mobility activity

The barriers identified by the mobility candidates to participate in mobility activities are principally lack of funding, lack of information about host offers and lack of time. It is anticipated that the lack of funding barrier, which was pointed out as well by the host organisations will be addressed by INFOBIOMED by means of the Mobility Funding System, described in the next section. On the other hand, the lack of information about host offers will be hopefully improved when the MBS enters into operation.

Barriers for participating in mobility activities	%
- Lack of time	46,67%
- <b>Lack of funding</b>	<b>73,33%</b>
- Lack of information about host offers	50,00%
- Lack of practical information about the host site	15,00%
- Lack of permission from your organisation	10,00%
- Not interested in mobility activities	5,00%
- No relevant benefits perceived	3,33%
- Personal issues (family, etc)	20,00%

Figure 22: Main barriers for participating in mobility activities

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## Mobility Survey C


90 surveys were submitted, and the majority of the respondents agreed on the inclusion of the items of information proposed by the survey. The level of publicity that this information should have was also asked, and the answers reveal that the information should be mostly public, except when it comes to personal data (names and contact data of staff, names of candidates, expertise of candidates) or other sensitive information like salary offered or desired.

### 7.1.2. Set up of a Mobility Funding Mechanism


According to the results of the Survey on Mobility Needs and Expectations, one of the key barriers for participating in mobility activities is lack of funding. To overcome this major barrier, the INFOBIOMED TMC has created a funding mechanism aimed at fostering the initiation of mobility activities among the network members. The idea behind it is to offer economic incentive for mobility experiences to occur.

A number of conditions should concur to benefit from the MFM:

- Sending and host organisations should be INFOBIOMED partners. The MFM will be opened only to network partners during 2005. After this first year of activity, the TMC will assess the success of the MFM and propose to the Consortium the possibility to extend it to third parties.
- The MFM is operative from the 1<sup>st</sup> of January 2005.
- Sending partners should send a member of their research group or department to another partner's premises.
- The work to be carried out by the moving personnel during the exchange period should promote an integrative BMI approach. Exchanges from BI to MI organisations and vice versa will be specially promoted.

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- The funded exchange should have an international dimension (sending and host partners must be located in different countries). The TMC may accept well-motivated exceptions.
- The duration of the exchange should be between 1 and 3 months. Exchanges longer than 3 months will only be exceptionally approved if duly justified.
- The funding allocated will be 4.000€ per exchange.
- Such funding will be allocated only to the sending partner.
- A maximum of 2 exchanges per year per sending organisation will be funded by the MFM. In case of budget restrictions and with due justification, the TMC can prioritise among exchanges submitted for funding (ex. prioritising partners that participate for the first time against partners that have already participated before, etc.).
- In order to be allocated funding, the sending organisation will have to send an MFM form to IMIM (WP3 Leader) at least two weeks before the exchange starts.
- The funding allocation will be decided by simple majority of the TMC members (one vote per TMC partner).
- Mobility participants and organisations commit to contribute with input about their mobility experience/learnings to the WP3 reports or deliverables when asked by the TMC. They should also submit a short report after the exchange has occurred, reporting the work done and the main results.
- When the work done during the exchange is disseminated, an acknowledgement to INFOBIOMED funding must be included (ex. ‘this work has been funded/partially funded by INFOBIOMED Network of Excellence’).

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The internal report establishing the MFM was approved by the Consortium in December 2004. The MFM has become operative in January 2005. The application form can be downloaded from the private zone of the website.

## 7.2. Workplan in years 2 and 3


### **7.2.1. Mobility Brokerage Service specifications and implementation**

The information gathered by the Mobility Survey was considered to be sufficient to trigger the specifications and implementation of the Mobility Brokerage Service, that should be available by month 15.

The MBS will be the central piece used by INFOBIOMED for promoting mobility in the field of BMI. The INFOBIOMED Mobility Brokerage Service is envisaged as a secure web-based marketplace addressed to create and to reinforce a BMI European Community. In this web site, host organizations will be able to publish job or mobility offers and candidates will be able to post their personal data, interest subjects and mobility or job demands. Both host organisations and candidates will be able to look for offers through the MBS. The MBS will not be restricted to INFOBIOMED partners or participants.

The system will automatically match offers and demands according to the matching criteria defined and will notify matches properly to the interested parties. Also, users might search offers manually. MBS will be useful to promote contacts between host organizations and researchers, but it will not serve to negotiate offers and demands, which will be done directly by the interested host and candidate.

Currently, a software requirement specification is being written, in the form of an internal report, and a pilot of the MBS is being programmed accordingly. It is expected that the MBS pilot will be ready by March 2005 and the launch campaign will be in April-May 2005, after having conducted intensive testing internally.

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### **7.2.2. Mobility Funding Mechanism implementation**

The MFM previously described has entered into operation in January 2005. Several partners members have expressed their interest in taking advantage of this incentive and it is expected that around 4 mobility exchanges will occur during the first semester of 2005. The mechanism for applying and approving exchanges to benefit from the MFM is very simple and straightforward, but, if issues arise during the first months, corrections will be introduced after discussion at the next TMC meeting.

It is foreseen that a formal review of the MFM will be done after one year running, and at that moment it will be decided if the MFM can be opened to external parties to the Consortium during the 3<sup>rd</sup> year and under what conditions.

### **7.2.3. Quarterly review and analysis of results achieved**

Like in the case of training, the TMC will review and update quarterly the mobility workplan against the objectives set and will decide on corrections or complementary actions to be undertaken in order to achieve the expected results. The TMC will organise internal meetings previous to the Consortium meetings, in addition to the annual TMC meeting. It is to be said, that all TMC decisions having a relevant impact are validated by the Consortium.

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## ANNEXES