

TRAINING FOR MAINTENANCE SERVICES AND FACILITY MANAGEMENT FOR REAL ESTATE AND URBAN CONTEXTS. REPORT OF THE ACTUAL OFFER, ANALYSIS OF EXPERIENCES AND PROPOSALS FOR NEW EXPERIMENTATIONS

Claudio Molinari
Giancarlo Paganin
Cinzia Talamo
Politecnico di Milano
Dipartimento BEST
Via Bonardi, 3 - 20133 Milano - Italy
mail: cmolinar@polimi.it
mail: giancarlo.paganin@polimi.it
mail: cinzia.talamo@polimi.it

Silvano Curcio
Associazione Terotec
Universita' di Napoli Federico II
CLM "MGEU"
Viale Giulio Cesare 14
00192 Roma - Italy
mail: silvano.curcio@terotec.it

Gabriella Caterina
Paola De Joanna
Universita' di Napoli Federico II
CLM "MGEU"
Via Tarsia 31
80135 Napoli - Italy
mail: caterina@unina.it
mail: dejoanna@unina.it

Vittorio Fiore
Università degli Studi di Catania
Dipartimento DARP
Facoltà di Architettura
Via delle Maestranze, 99
96100 Siracusa - Italy
mail: v.fiore@unict.it

PAROLE CHIAVE

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ABSTRACT

The paper regards training for maintenance services and facility management for real estate and urban contexts. The aim is to present reflections, studies and experimentations about training developed inside different – often connected - researchers groups (University of Naples, Polytechnic of Milano, Terotec association) that have been working for many years on the themes of maintenance planning and management, always making the effort to transfer and spread knowledge from research and operational fields towards different levels of training.

The paper deals with several arguments regarding offer, demand and possible innovations in training and it is articulated in four parts:

1. actual scenario of buildings services and training demand;
2. the actual offer of different kinds of courses directed to maintenance services and facility management operators;
3. a proposal regarding a didactic model and guide lines for the selection of thematic areas the profile and the functions of the main operators in maintenance services;
4. some considerations about possible innovations in training regarding didactic methodologies and supports.

BUILDINGS MANAGEMENT SERVICES: SCENARIO AND TRAINING STRATEGIES

Maintenance services and facility management are business areas very new, that are rapidly growing up and are increasing their market scenarios; at the same time traditional real estate management structures are quickly changing their missions toward innovative and more advanced organizational models. The result of this complex scenario is the development of new management functions, that operate in very dynamic fields, that are experimenting many behaviours and organizational models and that rely on multidisciplinary contributions; but at the same time they have not yet completely consolidated several interrelated aspects, such as planning and control procedures, quality and costs indices for services evaluation, professional profiles and skills of the main categories of operators.

Regarding to this last aspect, many of the different actors of this changing scenario in urban and real estate management (public and private owners, facility managers, services suppliers, contractors, real estate consultants, etc) more and more are searching for specific training experiences. In general the demand requests a training offer able to support the processes of growing and maturation of the operators and at the same time adequate to their specific needs, sometimes not completely expressed.

Looking at the actual, complex scenario of buildings services market, the studies and the experimentations in the field of training have to consider some important aspects.

Considering services operators it is to notice that:

- the key operators of service offer have different backgrounds.

Nowadays there is a large variety of operators - different for dimensions, organizational structures and approaches, origins, financial resources, etc – that work both in competition and in association, in many possible configurations and in a very dynamic manners. In table 1

are summarized the main characteristics and skills of different categories of operators. It is possible to notice that on one side there are operators coming from the fields of industrial Global Service and of specialized and specific services. These operators are very skilled in the field of organization of processes and are expert users of management techniques and methodologies, but at the same time they haven't a long term experience on building components. On the other side there are operators with a deep knowledge about buildings behaviours and technical interventions, but needy to get more and more experienced in service management methodologies and tools.

So, today one possible mission of training strategies is to create, through a common base of knowledge, the conditions to support the dialogue, the interface and the interaction between the different kinds of operators.

- Clients are changing their tasks.
In the past, inside an "in house" model of real estate management, the main tasks of owners were selection and coordination of all the different service suppliers; today the main tasks are the definition of global service requirements, the selection of an unique service provider, the control of service results. At moment it seems that demand operators have difficulties in defining the services results in terms of quality requirements, in drive the ways in which the offer could better organize the services and in organizing control activities;
- the professional profiles of services suppliers are still in a process of definition.
The tasks engaged in buildings maintenance and facility services regard, with different combinations, both technical (building components and equipments), organizational and economical competences. Nowadays a panel of tasks is not yet completed and consolidated, so, following the maturation of buildings services field, it is important to gradually trace reference profiles of competences in order to define training offers specific for the large range of different requests.

Looking at culture and practices in the buildings services it is to underline that:

- buildings services represent a sector moderately recent, that is still growing and the process of definition of cultural and operative references is not yet completed;
- competences required to buildings services operators engage many disciplines that have to adapt and to make original their contributions for new professional profiles;
- a transfer process from industrial Global services to maintenance and facility management services is surely fundamental, under condition that the many transferable procedures, methods and tools are properly adapted to buildings characteristics and behaviours.

Taking into account all these considerations it is possible to establish some basic criterion that have to guide training strategies in the field of maintenance and facility management services:

- 1) research and training must be strictly connected.
Research should regard on one side both studies about transfer processes and elaborations of procedures and instruments, on the other side analysis of case studies, of best practices and of data rising from services experiences. As building services have not yet a

consolidated scheme of reference themes, only a direct relationship between research and training can allow to transfer rapidly the results of studies to teaching in a process on continuous improvement;

2. training offer has to be flexible.
As maintenance and facility management market is in a constant process of maturation, training offer must be able to follow dynamically the changes in demand;
3. training offer has to be adaptable.
As training demand is very various, training offer must be able to adapt forms (kinds and duration of courses), teaching methodologies, type of teachers and contents of didactic themes in relation to different, specific requests.

Table 1: *Different categories of operators in the field of buildings management services*

Great operators
Operators coming from the industrial Global Service field, firms engaged in utilities management (production and distribution of gas, water, fuel, etc.), firms rising from industrial groups through "spin off", international firms operating in industrial maintenance and energy areas, real estate consultants, and so on. They are operators very skilled in organizational themes, with significant financial resources and with an easy access to banking establishment, that only now are beginning to deal with buildings characteristics and behaviours
Specialized suppliers of services
Operators, in the fields of energy management, cleaning, security, etc , that try to profit by their consolidated relationships with their Clients and by their capabilities in designing and managing services, in order to extend their business areas by adding new services
Construction firms
Firms traditionally operating in the field of constructions that now are looking for new business opportunities inside real estate services in which they can apply their technical knowledge about buildings, their capabilities of relationship with public administrations, their expertises in construction supplier management
Medium-small firms gathered in networks
Small firms traditionally occupied in technical works with operational expertises in buildings and equipments maintenance, that now are gathering together in networks in order to collaborate and to act as a "single entity" in service supplying. The aim is to answer in a very flexible and dynamic way to various market requests with different temporary aggregations of services, trying to be more and more adherent to clients requirements. The network may offer activities of design, coordination and control of the assemble of services.
Small firms
Small firms traditionally occupied in technical works with operational expertises in buildings and equipments maintenance, that act ad subcontractors inside integrated services.

TRAINING MODELS

Considering the above mentioned scenario and criterion for training strategies, it is possible to define two models:

1. the traditional training model;
2. the modular model.

Traditional training model

It is possible to speak about traditional training model considering consolidated practices, such as degree and post degree courses.

This kind of model has the aim to consider a large demand and to respond to it with a offer that tries to cover a wide range of requests by providing courses centred on a base of

common and fundamental disciplines and themes eventually integrated by thematically oriented contributions.

The application of this model drives to courses that can have different articulations and that are both the ones offered by universities (such as first level degree, second level degree, master of first level, master of second level) and the ones offered by private organizations. In both cases the training offer regards mainly courses based of a predefined panel of didactic sections. An innovation of this model regards the assumption of the criterion of flexibility and of adaptability. Especially for Masters courses it is possible, year by year to modify the articulation of the course or the contents of some didactic sections on the basis of an observation of the dynamics of services market and of training demand. Degree courses have a higher level of inertia, even if in these last years new university regulations are leaving more autonomy than in the past in the choices of courses and in the possibility to orient training paths.

It is possible to summarize this model by identifying it as a “closed system”.

Modular model

This model is based on the concept of specific training offered to a specific demand. Assuming this model the aim of training offer is not to find fundamental and common disciplines for a wide demand, but on the contrary, to identify the characteristics and the requests of specific demand and consequently to draw training profiles corresponding to identifiable professional profiles considered in precise contexts of services. To pursue this aim the way is not the realization of many different and specific courses, but the realization of the conditions necessary to create specific courses either defined on the basis of consolidated professional profiles, or “on demand”, i.e. to be activated IF, WHEN and HOW a specific demand will request.

So, the application of this model drives to the definition of a modular catalogue of possible training offers that is represented by different kinds of didactic modules based on:

- competences that can be found in a variety of contexts (universities, professional courses, firms, consultants, specialists, researchers, etc.);
- training objectives (at the end of the course the trainee will be able to do ...)
- main arguments;
- professional profile (target);
- duration (minimum and maximum number of hours);
- entry level of competences;
- didactic methodologies (lesson, exercitation, workshop, etc.).

In this perspective, an organization that assumes the modular model is concentrated not on the definition of a specific course, but on a process based on (Figure 1):

- 1) the definition of the modular catalogue on the basis of different kinds of possible, probable demands related to hypothesis of professional profiles (scheme of the system);
- 2) the definition of appropriate competences and teaching methods for the didactic modules and research of possible available teachers;
- 3) the observation of demand;

- 4) the individuation of consolidated types of demand and, on the basis of their characteristics, the definition of offer; at the same time, another possible action is to support specific demands in order to explicit their needs and requests with the aim to select and organize *ad hoc* training offer;
- 5) organization of a detailed training offer by selecting, coordinating and controlling different didactic modules, orienting them (on demand) about aspects related to contents, duration, didactic methodologies, interface and interaction with other modules.

It is possible to summarize this model by identifying it as an “open system”, flexible, variable, adaptable.

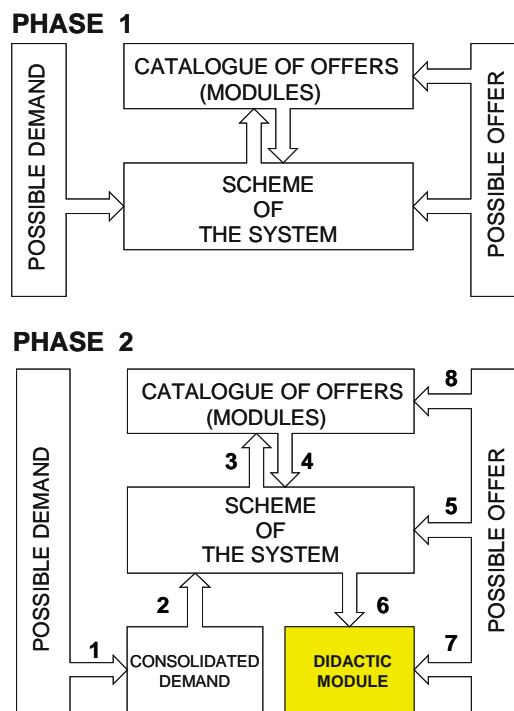


Figure 1: Modular model. The two phases of development of a modular catalogue.

TRAINING OFFER IN ITALY

Actually in Italy it is possible to observe an increasing offer of training courses regarding various themes related to buildings management services.

Terotec Association every year elaborates a study (Censiform) regarding researches and analysis of training offer.

From this report it is possible to extract and underline some aspects:

- in the last two years it has been possible to notice (figure 2) a grow in offer regarding university courses and especially in courses proposed by private training organizations (almost doubled). Even if the observation is done on a very short period, this is probably the hint of a progressive extension and maturation of training market. In an initial period University, starting from research results, partly anticipates demand and creates the conditions to spread and consolidate some basic

- cultural references. On this ground extra university organization, very mindful towards demand and its variations, proposes courses, often regarding specific themes;
- this trend is confirmed by observing Table 2. The offer regarding themes related to buildings management services and represented by Italian Universities is characterized by a wide range of forms of courses, from the simple modules inside refresher course to the more articulated forms of degree and PhD. Extra university offer is *viceversa* essentially concentrated on workshops and refresher courses, in general regarding specific arguments, short in time, and easy to be varied edition by edition, in order to be as much as possible able to intercept the dynamics of demand;
 - considering training strategies of Universities it is to underline the fact that still some years ago the offer was essentially centred on single courses inside general degree courses and on short refresher courses (more or less with a duration of 30-40 hours). In the last years, besides this kind of offer another kind of offer is rising, constituted by oriented institutional courses, very articulated and of medium-long duration, such as Masters (one year duration), degree courses of II level (two years duration), PhD courses (three years duration);
 - with regard to professional profiles (figure 3), analysing declared objectives and contents of training offers, it is possible to notice that nowadays all the main figures of buildings management services are present. In fact, with different percentage, training offer regards competences in the field of asset, property and facility management. Beside this kind of offer, that is directly related to specific professional profiles, there are two other kinds of training offers, both of them mainly proposed by Universities, that regard themes transversal and common to the three management competences: on one side a training offer regarding the general theme of real estate and urban maintenance, that is evidence of a still significant demand of contributions able to consolidate the foundations of knowledge in the field of maintenance; on the other side courses regarding the specific theme of safety and security management;
 - comparing year by year the contents of the different courses it is possible to notice that there are constant actions of improvement, diversification, specification, that are hint of a stable attention for demand variations and at the same time for training feedbacks;
 - still comparing year by year the courses it is possible to observe an increasing involvement of firms, that sometimes are present in the phase of course definition and mainly in training actions both providing teachers and offering apprenticeship experiences.

Finally, it is necessary to underline that nowadays training market provides a very wide range of courses, different for: duration, structure, themes treated, professional competences, profile of teachers, entry levels of competence. Even if this scenario is not yet completed and organic, it is possible to suppose a continuous process of growth.

Besides, it is important to emphasize the fact that the different courses have not to be considered as alternative solutions but, on the contrary, inside an integrated view that can lead for instance to:

- a constant action of knowledge or competence updating through periodic refresh courses;
- a specialization through a Master course constantly updated or improved through periodic refresh courses;
- a complete training path that begins with didactic module in degree courses of I level, goes on with a Degree of II level (like the one in Buildings Management proposed by Polytechnic of Milan) and then can continue with a Master of II level or with a PhD course.

Considering these many and increasing possibilities of training, nowadays some actions appear fundamental:

- to apply a modular model in training with the aim to connect inside an unique net the rich offer, in order to avoid to loose important opportunities;
- to monitor training demand and offer with the aim of continuous improvement by constantly verifying satisfaction levels and teaching performances in relation to professional profiles needs and evolutions.
- to pursue research in order to transfer constantly experimentations and innovations into training.

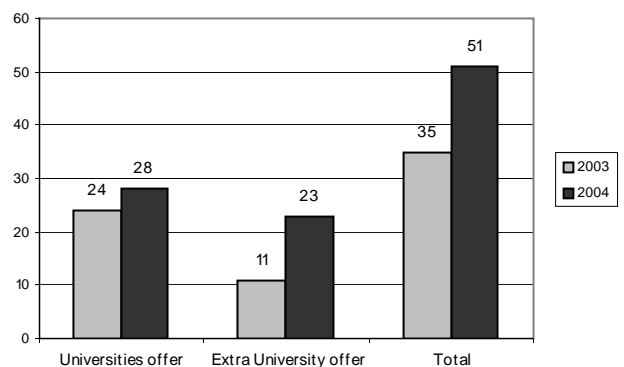


Figure 2: Growing of training offer in the field of maintenance and facility management in Italy. Number of courses in years 2003-2004. Source: Censiform 2005 (Terotec)

Table 2: Types of university and extra university training offer in 2004. Source: Censiform 2005 (Terotec)

TRAINING OFFER	number
University	
Didactic module in refresher course	1
Didactic module in degree course	2
Didactic module in Master	3
Workshop and refresher courses	6
Refresher course	2
Degree course of I level	1
Degree course of II level	1
Master of I level	6
Master of II level	5
PhD	1
Extra University	
Workshop and refresher courses	21
Master	2

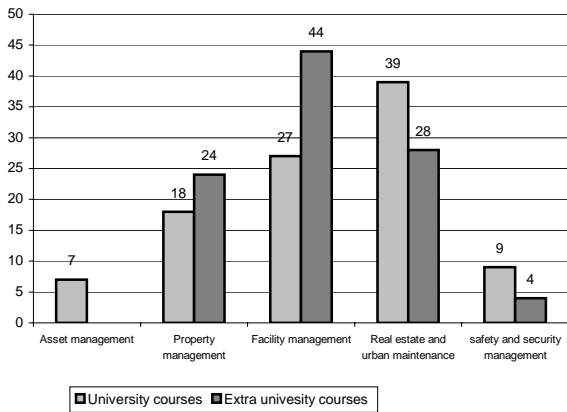


Figure 3: Percentage of reference professional profiles in training offer in 2004. Source: Censiform 2005 (Terotec)

PROFESSIONAL PROFILES FOR BUILDINGS MAINTENANCE SERVICES

The analysis of buildings maintenance services market and of training offer confirms the hypothesis developed some years ago by some researcher (Molinari, 1994, Talamo, 1998) about three professional profiles of references:

1. project maintenance manager. He operates inside the design phase, his mission is to orient and to harmonize project decisions and solutions with requirement related to maintenance and facility management. As a consultant he can elaborate maintenance manuals (see UNI standard 10874) and plans inside the phase of detailed design; at the same time he can orient documentation and basic information of projects for maintenance services, by defining structure and details of content of technical documents and lay-out models (see UNI standard 10831);
2. maintenance manager. His role regards the organization of strategic decisions, he defines policies and strategies of maintenance services, coordinates informational and analytical activities (surveys and diagnostic activities, documentation reviews, etc.), plans the maintenance activities (elaboration of the maintenance plan), directs and controls the execution of planned maintenance activities, acts as supervisor in the management of the information system.

Considering Global Service contracts (see UNI standard 11136), it is possible to identify two different figures of maintenance managers that interact between them.

One operates inside Client's organization with different functions, such as: to analyse profiles of activities to be put into services, to organize documentations and information about buildings, to elaborate demand specifications (quality standards, services standards, control parameters and modalities); to evaluate offers; to direct and coordinate control activities during Global Service execution; to interface with maintenance managers of service suppliers; to act in the case of non conformities of services; to act as supervisor in information collection and management.

The other one is the maintenance manager of Global Services supplier and he can have different functions,

such as: to analyse services demand specification, to coordinate surveys activities; to elaborate offer of Global Service; to coordinate different suppliers and to select sub-contractors; to plan and coordinate maintenance activities according to demand specifications; to interface with Client's maintenance managers; to act in the case of non conformities of services; to coordinate information collection and management.

3. operation maintenance manager. He has an executive role, he supports the maintenance manager to specify the technical and more operational aspects of the maintenance plan. At the same time his function is to put the plan into practice, to act as a supervisor during maintenance activities and to collect feedback information from maintenance activities.

All these professional figures, operating inside a multidisciplinary context, base their competences on a different mix of technical, organizational and economical knowledge and at the same time they have the function (with different roles) of interface between different specialists and operators.

In order to define training demand and offer, it is important to describe the functions and the know-how regarding these three figures, also considering the fact that the competences in the field of maintenance are required, in different measures, in all services management models (facility, property and asset management).

A WORK IN PROGRESS APPLICATION OF MODULAR MODEL FOR TRAINING

Here, it can be interesting to describe a work in progress application of a modular catalogue carried out by some university researchers with the support of Terotec association.

Table 3 shows a part of the modular catalogue that is under elaboration.

The modules have been defined on the base of an investigation conducted on:

- demand, in order to identify training needs. The investigation is carried out both through questionnaires and through interviews to significant operators (public and private real estate owners, service managers, consultants, construction firms, etc);
- offer, in order to make an inventory of main training operators.

The results of this work will be a modular catalogue, articulated for main disciplinary and thematic areas. For each area are identified basic modules regarding fundamental elements of knowledge and thematic modules regarding specific themes.

For each module are described:

- range of duration (minimum and maximum);
- teachers and training context. There are different kinds of teachers (university professors, specialists, consultants, operators from firms, service suppliers operators, private and public Clients, etc);
- training structure and methodologies (lessons, exercitation, stage, training on the job, etc.)
- target, that is to say the professional figures and the functions that can be interested.

Table 4. Example of training modular catalogue

Title	Duration (min-max)	Offer	Didactic method.	Target
PROCESSES AND SERVICES MANAGEMENT AREA				
Basic modules				
Fundamentals of Management theories				
Organization of production and of logistic systems				
Quality systems management				
Planning techniques				
Facility management				
Property management				
Asset management				
Other				
Thematic modules				
Global service management				
Supply chain management				
Key performances indicators				
Costs indices				
Risk analysis techniques				
Benchmarking techniques				
Maintenance service audit				
Due diligence process				
Others				
INFORMATION TECHNOLOGY AREA				
Basic modules				
Cad Systems				
ERP systems (Enterprise Resource Planning)				
Information systems				
Others				
Thematic modules				
Data base management				
Information systems for real estate management				
Knowledge management systems				
STANDARDS AND REGULATIONS AREA				
Basic modules				
Public Works regulations				
Services contracts regulations				
Administrative law				
Health and safety regulations				
Elements of civil law				
Fiscal regulations				
Thematic modules				
Contract management				
Technical regulations for buildings				
Service level agreements				
Global services contracts				
UNI standards				
CEE standards				
ECONOMICAL, ESTIMATIVE AND FINANCIAL AREA				
Basic modules				
Fundamentals of economy				
Economy for firms				
Estimative techniques				
Real estate finance				
Thematic modules				
Methods and techniques of buildings evaluation				
Costs analysis techniques				
Real estate maintenance and renovation costs				
Life cycle costs analysis				
Techniques of budgeting				
Techniques of investments evaluation				
Models of construction market financing				
Real estate maintenance and renovation costs				
MATHEMATICS AND STATISTIC AREA				
Basic modules				
Statistic and probabilistic methods and stocastic processes				
Reliability theories				
Decisions theory				

Statistical theory of decisions				
Others				
MAINTENANCE PLANNING AND MANAGEMENT AREA				
Basic modules				
Fundamentals of maintenance				
Processes and methods of building maintenance				
Processes and methods of urban maintenance				
Maintenance service management				
Other				
Thematic modules				
Real estate inventory methodologies				
Maintenance manuals and plans				
Maintenance budget				
Maintenance service indicators				
Maintenance program				
Scheduling and reporting				
Spare parts logistic				
Maintenance work site				
Reliability, availability, maintainability and safety assessment				
Health and safety in maintenance activities				
Others				
BUILDINGS TECHNOLOGY AREA				
Basic modules				
Fundamentals of buildings technology				
Fundamentals of science and technology of buildings materials				
Buildings pathologies and degradation processes				
Techniques of evaluation and control of buildings				
History of building construction techniques				
Other				
Thematic modules				
Diagnostic methods and techniques				
Methods for buildings systems analysis (failure modes and effects analysis, cause tree method, success diagram method, preliminary hazard analysis)				
Life cycle analysis for buildings components				
Durability of buildings materials and components				
Techniques of buildings control and evaluation				
Others				
BUILDINGS PHYSICS AND EQUIPEMENT INSTALLATION AREA				
Basic modules				
Fundamentals of buildings physics				
Fundamentals of equipment installation				
Buildings equipment installation pathologies and degradation processes				
Techniques of evaluation and control of buildings comfort parameters				
History of building equipment installation in buildings				
Others				

INNOVATIONS IN TRAINING METHODOLOGIES

Considering the theme of didactic methodologies for training in the field of building services, it is possible to state that today a process of real investigation and experimentation has not yet been developed. Doubtless traditional frontal didactic forms are not any more sufficient for new needs (regarding interdisciplinary themes, innovative management models

and operational practices) and for a very dynamic scenario of services.

Studies and researches suggest to investigate the methods of strategic action based on forms of active engagement, also by placing the learners in working situations, adequately organized in relation with teaching aims.

These forms of training can be improved through the support of tutors whose aim is to follow the learner in auto-reflective practices during working actions.

In association with this practice it can be very useful to base training action on heterogeneous working groups of learners involved in case studies, in auto-cases and in simulations with contribution of multidisciplinary teachers.

Obviously the most appropriate didactic form should be defined on the base of knowledge, of entry level and experiences of learners, of training aims, of professional profiles and functions of reference.

CONCLUSION

Examining the actual scenario of buildings services it is possible to underline some concluding observations:

- building management services is an innovative field that requires innovative ways of interaction between disciplines, specific and original management models and operational procedures. At the same time new profiles of competences emerge and require new training models and new didactic forms of knowledge spreading;
- research has an important role in the interpretation of a very dynamic, still changing scenario;

- research and training must be very connected in a constant process of identification of knowledge needs and of teaching experimentation;
- training can have an important role in the process of maturation of buildings services market by spreading knowledge and by consolidating a common base of references; besides training can have an important role supporting demand in defining its needs and requests.

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