

INFORMATION SERVICES TO ENABLE EUROPEAN CONSTRUCTION ENTERPRISES AN OVERVIEW OF THE I-SEEC EUROPEAN UNION PROJECT

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ABSTRACT

Electronic information services are of key importance to the efficiency and effectiveness of the construction industry, and increasingly, such services need to transcend national boundaries. I-SEEC is a collaborative project funded by the European Union with the overall goal of creating an infrastructure to enable and link high quality commercial electronic information services throughout its member countries. This project started in March 2000 and finishes in April 2001. It builds upon a previous EU project - CONNET (CONstruction information service NETwork). This paper provides a description of the infrastructure already developed and the extensions and new services created under I-SEEC. The countries participating in I-SEEC are Finland, Iceland, Italy, the Netherlands, Slovenia, Spain, and the United Kingdom. Other countries and partners are encouraged to join in this initiative.

CONNET provides access to a range of high quality Internet-based services for the construction industry in Europe. It provides both a European entry point to identify resources and national entry points for localised service delivery. The European CONNET entry point provides a range of technology park services as well as industry-specific services. These services include:

- Management of security services, including installation and monitoring of security systems
- Help desk, providing a point of contact for potential service providers and for problem resolution
- Information broker role, enabling transparent access to information in the CONNET services
- Technology observatory service, including leading edge, current and best-practice technologies
- Provision of user profiles, allowing personalised delivery of updates in areas of interest
- Multi-classification support, permitting handling of national systems used across the EC.
- Inter-service communication services, allowing all comparable services to be identified and a query to be passed from one service to another service to answer.
- Multi-language support, enabling EC languages to be handled correctly and to provide basic translations between them.

The services offered by I-SEEC include a Technical Information Centre, Waste Exchange Centre, Electronic News Service, Calculation and Software Centre, Who's Who in Construction, Specialist Equipment Directory and a Best Practice Information service.

The CONNET infrastructure and the I-SEEC information services provide the means to promote effective use of information by construction industry professionals in an efficient and cost-effective way. The ability to pass queries from one high quality service to another in a different country is a substantial contribution to the CIB goal of providing information to achieve performance. This paper draws out lessons learned - both technological and practical - in the course of this multi-country initiative to develop a portal for the construction industry.

KEYWORDS

Internet gateway; information services; technology transfer; virtual technology park.

INTRODUCTION

I-SEEC has created a set of inter-linked national Internet gateways to quality information for the European construction industry. It builds upon the CONNET initiative of DG-III ETTN (1999) to provide the construction industry with an essential source of such information, by creating a "virtual technology park", accessible to the whole industry, regardless of national boundaries (see <http://www.connet.org/>).

The UK's Building Research Establishment (BRE) is the main contractor for the I-SEEC project with partners: BII (Finland), VTT (Finland), BCRM (UK), IBRI (Iceland), IBIC (Iceland), IKPIR (Slovenia), GCS (Slovenia), IETcc - CSIC (Spain), ICITE (Italy), and TNO (The Netherlands). New partners are invited to join and establish national versions of the services listed above, or even to establish further national gateways (see final section).

GATEWAYS TO INFORMATION

The concept underlying CONNET is that advantage can be obtained by establishing certain standard ways of describing information and tailoring searches to take account of these. Data models and interfaces (API) have been devised for all the services, using existing standards where possible. A European gateway containing utilities to enable these searches has been implemented at BRE and this offers an entry point to other national Gateways (see Figure 1 for relationships between infrastructure components). The latter may be hosted on the same machine as the European Gateway or by organisations in the host countries. In the current set of systems there are examples of both approaches.

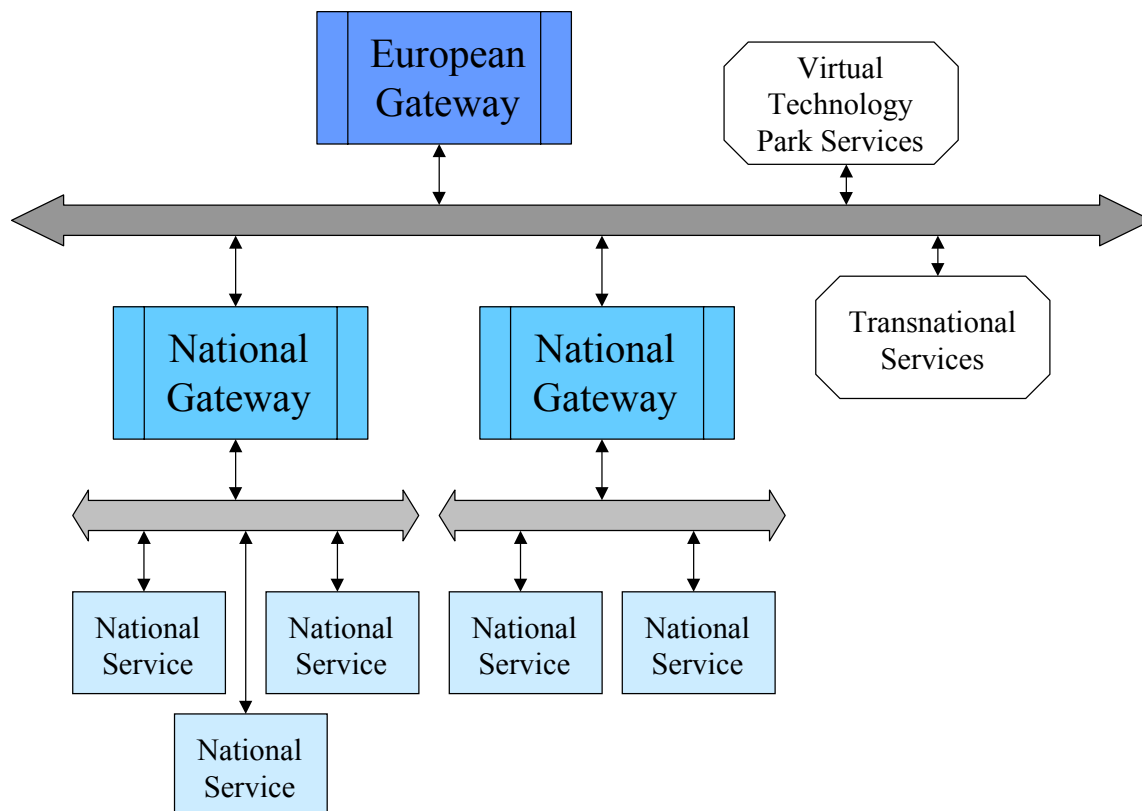


Figure 1 – CONNET Gateway and Services Infrastructure

Some of the systems enable e-commerce transactions to be executed and appropriate security systems have to be implemented. BRE allows online purchase of technical publications, from BRE and other UK publishers. Credit card transactions are handled through arrangements with Netbanx who verify

and guarantee security. Other models can be implemented by equivalent systems. For example, some only allow referral of the purchaser to the provider of the goods. In either case an extremely valuable service is provided by the CONNET systems in enabling a comprehensive search to be conducted to identify the existence of appropriate technical information from one entry point.

A national Gateway can be set up to provide information on only its national products and services but it is more useful and more interesting to allow searches to be extended to the other collaborating services (see Figure 2 for a generic national infrastructure). Restrictions on the language of the original material can be placed by the user in setting up the search conditions. Searches can also be limited to a subset of the available national services.

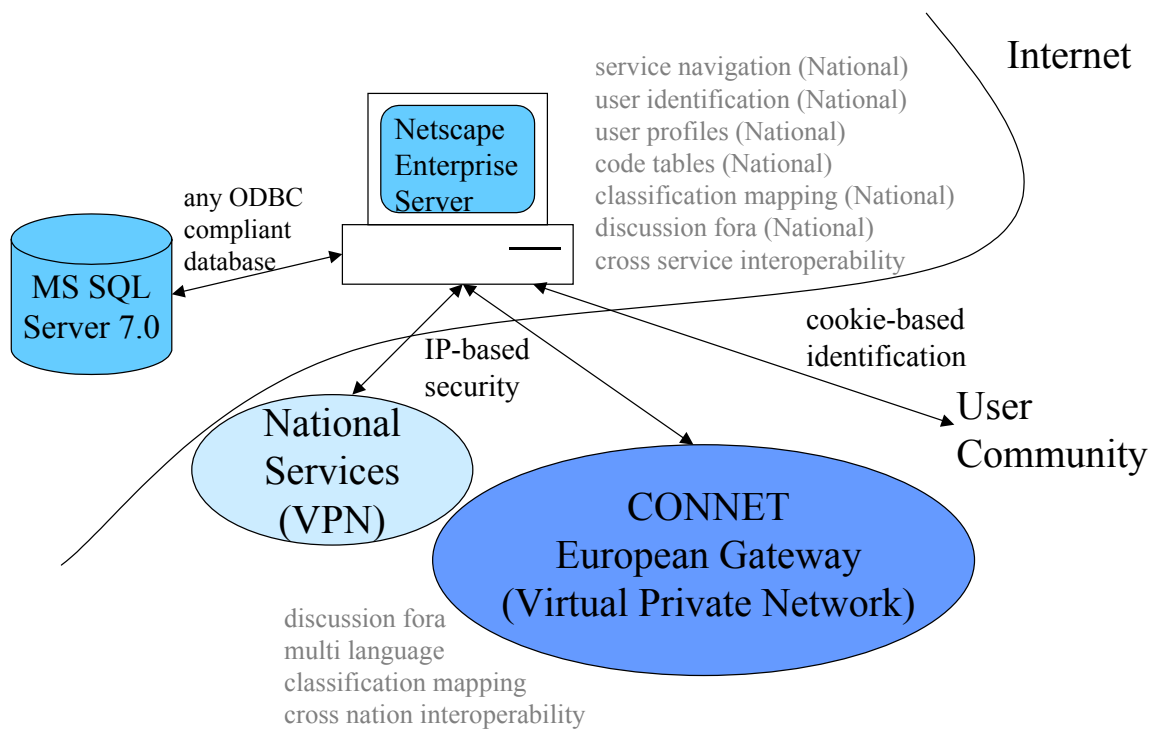


Figure 2 - Functions and Structure of a National Gateway

EXISTING CONNET SERVICES

Publications (Technical Information) Centres

These address the problem of locating technical publications on a particular topic. Some publications are easily accessible with ISBN numbers, whilst many other, equally valuable, ones are known to only a few specialists and may not even be well documented within their originating organisations. The percentage of e.g. BRE publications that can be found by an Amazon.com search is quite small. Most technical establishments have a collection of 'grey' publications that are hard to find.

The BEBO service that is part of askBRE (<http://www.connet.org/TIC/UK/>) is the UK's single point of access for the identification of high quality technical construction-related publications. This covers a range of material from organisations, mostly within the UK: e.g. best practice guides, standards, directives, technical notes, etc. Publications can be purchased directly through the online sales systems provided. At the time of writing Dutch, Italian and Spanish services have also been implemented. The Spanish partner is also looking at incorporating a technical frequently asked questions (FAQ) component to the system to help solve common problems, for example, in relation to changing national codes.

Waste Exchange (Materials Interchange) Centre

These provide a service to match waste or excess construction material to potential users for recycling. There is interest and actual services in Finland, the Netherlands and potentially in Iceland.

One service currently implemented (<http://www.connet.org/WEC/UK>) is an Internet-based notice board tailored to the needs of the UK construction and demolition (C&D) industry. It comprises four parts:

- materials for sale or free collection for a variety of recycled materials and demolition products
- unused materials which include over-ordered and unused stock for sale
- 'materials wanted' board
- 'forthcoming demolitions' board to notify others of potential sources of waste.

Those seeking materials can search for up to 30 different categories of recycled or unused products, and the search can be UK-wide or confined to the seeker's geographical region. Those supplying materials post their notifications onto the system via a structured form.

A key feature of the Waste Exchange model is its geographical categorisation of data, enabling users to find the material closest to them, thus minimising transportation, which is both expensive and harmful to the environment. This is adaptable to different regions, countries and for individual organisations' use.

Calculation and Software Centre

(<http://www.connet.org/CSC/CivilEng/>) provides a virtual library of software that is available for architecture, engineering and construction. This is a central service as it was felt unnecessary to create separate national systems. In contrast with the other services, this is an English language service, which was deemed acceptable by all the I-SEEC partners.

It includes downloadable demo-versions and full featured applications, as well as web-enabled applications, calculators, applets and components. It provides an outlet for software vendors to advertise and distribute their software.

The virtual library is fully searchable according to several descriptors and is also classified. Where applicable, the software can also be executed on-line as a calculator, applet, or component. The interface to the components is described in a standard, computer readable format that eases the integration of the components with other Web-enabled software.

The library is partly maintained automatically by robots that scan repositories of engineering software, CAD vendor sites, etc. Vendors are allowed to register their products interactively through Web forms. Vendor registered items have precedence over the harvested ones in user searches. Strict editorial policies ensure that only relevant items are made publicly available from the library.

Internet Signpost (Electronic News) Service for Europe

This (<http://www.connet.org/NS/Intl/>) service is an Internet-based system, similar to AltaVista in operation, for closely targeting information at specific users in the construction domains. This is achieved using 'push technology' to notify individual users that information relevant to their own specific requirements has been posted (or recently updated) on an Internet site.

The system is more sophisticated than conventional e-mail, for two reasons:

- the user views the information through a web browser, enjoying enhanced graphical presentation of the material, including the possibility of viewing illustrations

- the information provider does not have to create special material for each individual user, but merely uses the system to inform users of relevant content.

Rather than 'broadcasting' all information to a given group of users, the service employs a user-defined 'filtering' mechanism that enables the user to select, in advance, only those categories of information that will be of interest. Users are notified by e-mail of a relevant site, and they can then browse the information either directly on their machine, or by going to the supplier's web-site in their own time.

ADDITIONAL INFORMATION SERVICES CREATED WITHIN I-SEEC

Who's Who in Construction for Individual European Nations

There are many tens of thousands of professionals and firms in the construction industry (with well over 90% being classified as SMEs). Identifying who to partner with on a new project can be time consuming and in some cases risky.

The majority of professional organisations (architects, civil engineers, building service engineers, etc) record their members and their specialisms. Some of these lists are published, and some are available electronically. However, a register which is widely available to the whole industry linking location, skills, recent projects undertaken, certifications, etc is not generally available.

These services have been set up by the participating organisations so that a user can identify organisations across all areas of the construction industry that have particular skills in a given geographical area. The information was collated by drawing upon the resources of existing membership organisations. Legal concerns prevented provision of information about individual professionals but a facility to allow them to enter their own skills has been provided. These might include skills possessed, projects recently completed, specialist equipment available, software systems utilised, qualifications and certification undertaken. At the time of writing information on organisations from four countries have been implemented (with the other three under development).

Equipment Suppliers and Specialist Facilities of Various Nations

This service allows the user to identify suppliers of specialist equipment and facilities based on their needs. It will provide a more intelligent search, and more complete information, than is currently available from paper-based catalogues or their electronic counterparts. Current systems are very much based on a yellow-pages model where the supplier of a particular class of equipment can be identified, but not the parameters of the equipment (can it do the job you have to do), the location, the availability, etc. Once the suppliers of equipment are identified this service will provide online purchase or lease in association with the supplier. At the time of writing it is expected that these services will be populated in the first instance with information about services and specialist facilities from the participating organisations (e.g. large burn halls, strong floors, etc.).

National Best Practice Initiatives

Best practice in construction is a major issue for the whole profession, having an impact on most of the work that is undertaken in the industry. For example the key objectives for the UK programme (<http://www.cbpp.org.uk/>) are to:

- *create a desire for improvement by identifying, publicising and supporting the use and benefits of adopting improved business practices*
- *offer an initial point of contact for organisations wishing to improve*
- *facilitate links between such organisations and those with the knowledge of how to improve*
- *provide techniques, advice, knowledge, research results, and tools for best practice*

The CONNET search tools have enabled powerful searches to be made across the separate national services and, indeed across the different types of service. This includes information on case studies, activities and events, sector initiatives, and discussion fora.

INFRASTRUCTURE EXTENSIONS

Multi-classification and multi-language support systems, along with well-defined information security and infrastructure management procedures, have been added to the infrastructure as part of I-SEEC. Portions of the former two systems are discussed below.

Multiple Language and Classification Support Within I-SEEC

As the Internet grows so does the amount of information available to CONNET-type services, and consequently the difficulty of finding exactly what a user requires. This problem is especially acute for systems providing services across several languages or drawn from many providers. There are two broad approaches to address this problem:

1. Classification of information so the user can navigate to the required information or at least search in the correct area. The main difficulties here are: a) finding a classification system acceptable to all users - this is a real problem in construction across Europe and within nations due to the composition of the construction industry itself, and b) ensuring information has a classification attached - not something that can usually be relied upon.
2. Use of language tools to broaden or narrow a search by use of synonyms, hypernyms and hyponyms. The main difficulties arise in developing an appropriate language structure. This should be hierarchical so that users can generalise and specialise their word, as well as displaying synonyms. There are tools such as WordNet (URL1) which is a general lexical database for English. There is very little that covers the specialist vocabulary in construction.

The approach taken in I-SEEC is to create an online thesaurus for use in construction and include as synonyms translation of technical terms into several European languages. Classification codes from several popular European classification systems (EPIC, Sfb, Talo 90) have also been added into this vocabulary. Previous construction specific lexicon (e.g., IETcc, 1962) are also being examined with a view to being updated and made electronic for inclusion.

The I-SEEC work has been performed in collaboration with STABU, the Dutch national specification organisation. They are working on a formal WEB Lexicon (URL2), a standard for "concepts" in AEC, that is also part of the European project E-Construct (URL3). I-SEEC acted as a "funnel" to collect terminology "as is" which then subsequently can be used as a feeder to the web lexicon.

Synonyms allow differing usages of technical terms to be catered for when searching. This is extremely important as the range of natural language terms used can be very wide - due partly to different specialisations of users who need to collaborate during a construction project, partly due to terminology being used in different countries, and partly due to the rapid developments in new terminology. An important feature of a thesaurus is that it can be organised so that relationships between concepts are made explicit (Aitchison and Gilchrist, 1987).

These features make an online thesaurus particularly suitable for information searching:

- in all professions we get terminology from different countries
- with new know-how we get new terminology
- search results can be widened or narrowed by use of the relations between terms.

Existing dictionary/thesaurus services are limited due to:

1. Lack of coverage of specific topics.
2. Many services being owned by third parties which can involve expensive licences.
3. Lack of an API to allow automatic interaction with on-line systems.

The system developed in I-SEEC contains basic data such as:

- NLT: Dutch Term
- NLSN: Dutch scope notes
- FIG: Descriptive figures
- URL: Pointer to a URL where additional information can be found

And employs relations between terms such as:

- BT/NT: Broader/Narrower terms
- WT/PT: Wider/Part terms
- RT: Related Terms
- UF/USE: Used for/Use instead (synonyms)

A web-based database tool developed by IKPIR (URL4) was used by TNO to develop the thesaurus, initially in Dutch. Translations and additional terms were then provided by I-SEEC partners (English, French, Finnish, Icelandic, Slovenian, Spanish). In each translation there can be multiple translations into each language. Organisation of the web thesaurus enables easy upgrades, with quite a high level of automation, to any other primary language.

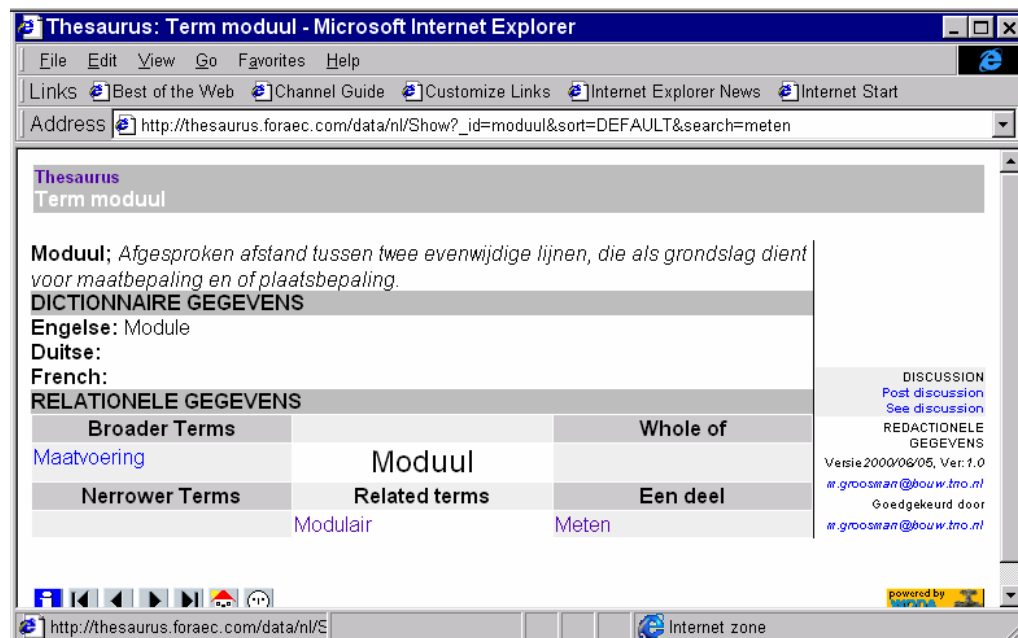


Figure 3 - Example of detail page for Dutch thesaurus - note the ability to refine search results through the use of synonyms and broader and narrower fields.

EXPERIENCE OF SETTING UP NATIONAL SERVICES

At the start of the I-SEEC project national gateways for construction existed in very few countries. As part of their input to I-SEEC the partners undertook to establish national gateways where none existed. Their experiences and motivation for these gateways are likely to be similar for other nations undertaking to develop a national gateway. In the following sub-sections the Italian and Spanish experiences are described.

The Italian Experience

The construction sector plays a very important role in Italy, contributing about 220,000 billion Lira, about 10% of the Gross Domestic Product. The main players are small and medium-sized enterprises

(SMEs) which are active all over the country. There are about 2,000,000 players in the sector and the enterprises working within the sector are generally small firms without the infrastructure to allow them to autonomously and continuously manage the technical information they need. It may therefore be stated that the sector is characterised by great numbers, great distances and a meaningful amount of information to be managed in real time. Internet-based services, such as those proposed by the I-SEEC project, seem to provide the best answer to the sector's information needs.

The Italian partner in the I-SEEC project is ICITE (the Central Institute for Building Industrialisation and Technology) belonging to the National Research Council, which carries out research and certification activities in the construction sector. Participation in the I-SEEC project proved to be very important for our Institute, since it has forced us to overcome an initial phase of stillness, mainly due to the difficulty in understanding the actual extent of the new possibilities offered by the Internet. Moreover, the technological infrastructure and know how of the CONNET project have been made available to the new partners in the project, and this allowed us to quickly realise and experiment with national services. ICITE has already started, experimentally, the following services: Technical Publications, Signposts to Web resources, and Who's who. For the time being, these services are hosted by the BRE, but, by the end of the project, they will be managed directly by ICITE.

As soon as these services are effective, it will be possible to optimise or even modify them according to the needs of Italian users. In particular, the Technical Publications service, the first to be realised in the sector, raised a certain interest in Italy. About 4,000 publications of the main Italian publishers of the sector have been submitted to date. The main goal for this service, besides increasing the number of publications, is to implement, by the end of the project, an e-commerce service. To this end, we are keeping in touch with publishers who have begun to work solely with products and services on the Internet. ICITE intends to promote the I-SEEC project at national level through a series of meetings with the main associations of the sector that are active all over the country (ANCE, Chamber of Commerce, etc) in order to propose implementations stressing on the usefulness and effectiveness of this kind of services.

It is worth underlining how important such a project is for Italian enterprises. In fact, it offers them the possibility of making themselves visible at the European level and having access to all the information they need to act in Europe.

The Spanish Experience

The situation in Spain is quite similar to the Italian case. However, some initiatives at the national level exist (e.g., BUILDNET: <http://www.buildnet.es/>) though without the possibilities of the CONNET initiative. The CONNET initiative allows development at a European level with the possibilities that this has for the construction sector in Europe and for the construction sector in each of the countries of the EU that join the initiative.

The IETcc belongs to the High Council of Scientific Research (CSIC), which carries out scientific and technical research in the field of construction and building materials and also provides technical support and technology transfer to the construction sector in Spain. IETcc has already started to implement some of the services available through I-SEEC. It contributes to a Technical Information Centre with more than 500 publications available from IETcc as well as publications from the two journals that the institute has run over the last 50 years (with useful and specific information for the construction sector). Through a national TIC service it is also possible to establish a connection with the main databases in Spain, with information about all the publications (662,159 references since 1972) and doctoral thesis, belonging to the Ministry of Education (MEC), the Center for Scientific Information and Documentation (CINDOC), and AENOR - the private institute for normalisation and certification in Spain.

Another service where the IETcc has had an active participation is the Who's who, though at the moment only the main associations and organisations are included. This service is currently hosted by BRE. The Spanish Signpost service will soon be available. Currently, it is not possible to develop national services in the other areas included in the I-SEEC project (software center, best practice, etc) but the IETcc will contribute where possible in order to improve them and give an added value to some of the services implemented by other partners.

Due to the importance of the services available on I-SEEC for the construction sector in Spain (both at a national level and across the other countries), the IETcc will promote these services at a national level through a range of workshops. Due to the importance of this sector in the economy of the country (it contributes more than 10% of the Gross National Product) and the necessities and role, mainly of the SMEs, that comprise about the 80% of our construction industry, it is necessary to have effective and useful tools that enhance the role of our industry in Europe.

OPPORTUNITIES TO COLLABORATE WITH CONNET/I-SEEC

For new partners to I-SEEC collaboration between electronic information systems could be usefully achieved at several different levels. This could range from simple pointers to existing information through to full implementation of existing I-SEEC services with full interconnectivity. In more detail partners could:

1. Link an existing/developing information system into a national gateway
2. Establish an information system in a country where one does not currently exist, either by
 - Developing independently but using the CONNET API (Application Programming Interface)
 - Re-using existing systems that have already been developed
3. Establish a national gateway where it doesn't currently exist
4. Register links and data with existing CONNET services, such as
 - URLs for relevant services
 - URLs for indexing by a crawler to provide coverage of national 'news' to CONNET sites
 - Provide data for TIC, Who's Who, or other existing services to enable these data to be incorporated in or hosted by existing CONNET/I-SEEC services

Note that to achieve the full functionality of the CONNET systems it is necessary to implement the API calls to allow compatibility with CONNET/I-SEEC systems and to allow queries to be passed between systems and results returned to originating system. The data models and APIs for all services have been documented and are freely available.

The advantages of building on the CONNET infrastructure and work to date are, depending on the level of adoption, to:

- Bring a wider audience to existing systems, enabling users of European and national systems to find your sites.
- Allow information on your publications, national organisations, specialist equipment etc. to be brought to the notice of the users of CONNET systems in the 7 countries currently participating in I-SEEC. For those countries without their own system this is a fast way of getting one set up.
- Help I-SEEC systems to be more compatible with your own systems and enable the latter to be improved for your existing users by using the API of existing CONNET services.
- Link your systems into a wider set of systems allowing increased functionality and generality (through the ability to widen searches to a European level) for your users and also for those of the other linked systems).
- Provide an enhanced free text index on the CONNET News Service (currently indexing 19,000 sites) that includes the information on your existing systems and will also bring a wider audience to your sites.

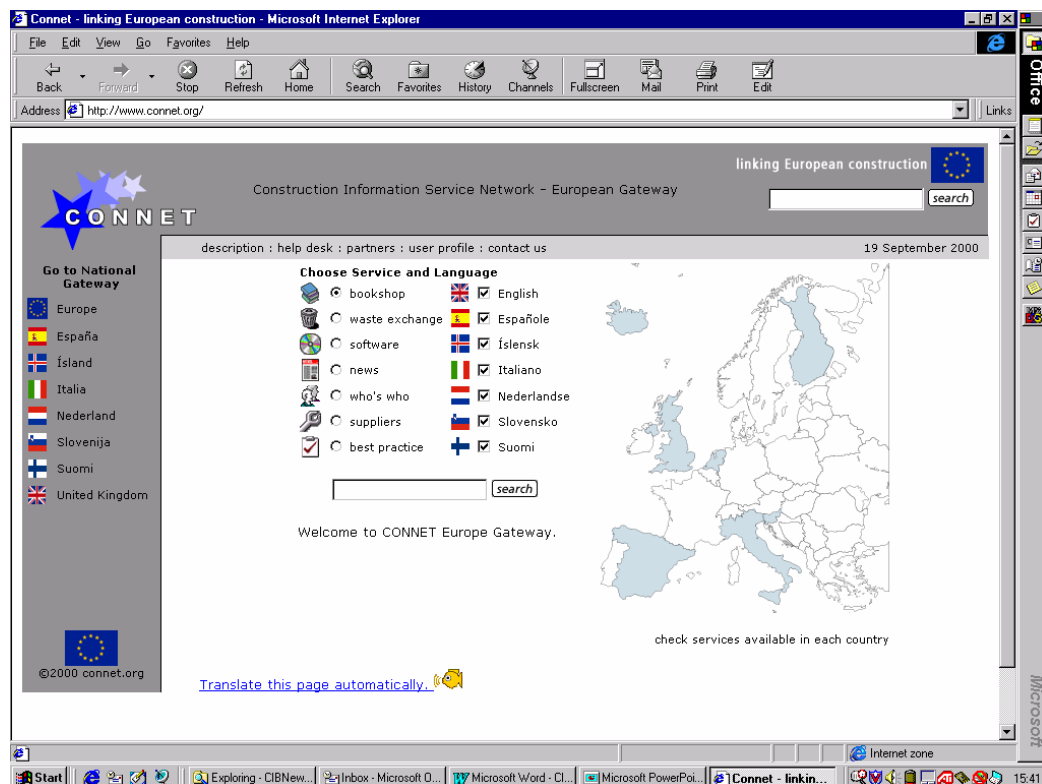


Figure 4 - European Gateway (Sep 2000)

DEMONSTRATION OF SYSTEM FUNCTIONALITIES

The I-SEEC project is due to finish in April 2001 and it is intended to give a demonstration of the system as part of the presentation. One brief example is shown here of the current main European Gateway interface (see Figure 4) and the results of a search on the term “Window” across all publications systems (Figure 5 shows results from UK and Italian TIC systems).

CONCLUSION

The CONNET initiative, through its adoption of standard interfaces and data models for information services, has allowed more consistent and more powerful provision of relevant information to construction professionals in Europe. Working as an open initiative has enabled national gateways to be established bringing together many (competing) providers in each nation for greater benefit to all involved. The infrastructure allows (through lexicon-based translations and classification mapping) for queries to one information system to be referred seamlessly to other CONNET-enabled systems and a more comprehensive and consistent set of results returned to the user. Through the integration of active technologies it has also been possible to provide for enhanced technology transfer based upon user interests.

This initiative demonstrates an alternative approach to the traditional development of competing portals. By concentrating effort in developing some standard structures, and by making software infrastructure and tools freely available to all, the whole industry can benefit from increasingly powerful and comprehensive services that are easy to use and available from every desktop. The CONNET initiative has achieved these goals by utilising the Internet and current technology to enable a large step forward for the industry. However, in taking this step many research issues have crystallised to be tackled in a more comprehensive manner (e.g., classifications, lexicons, and domain specific translation).

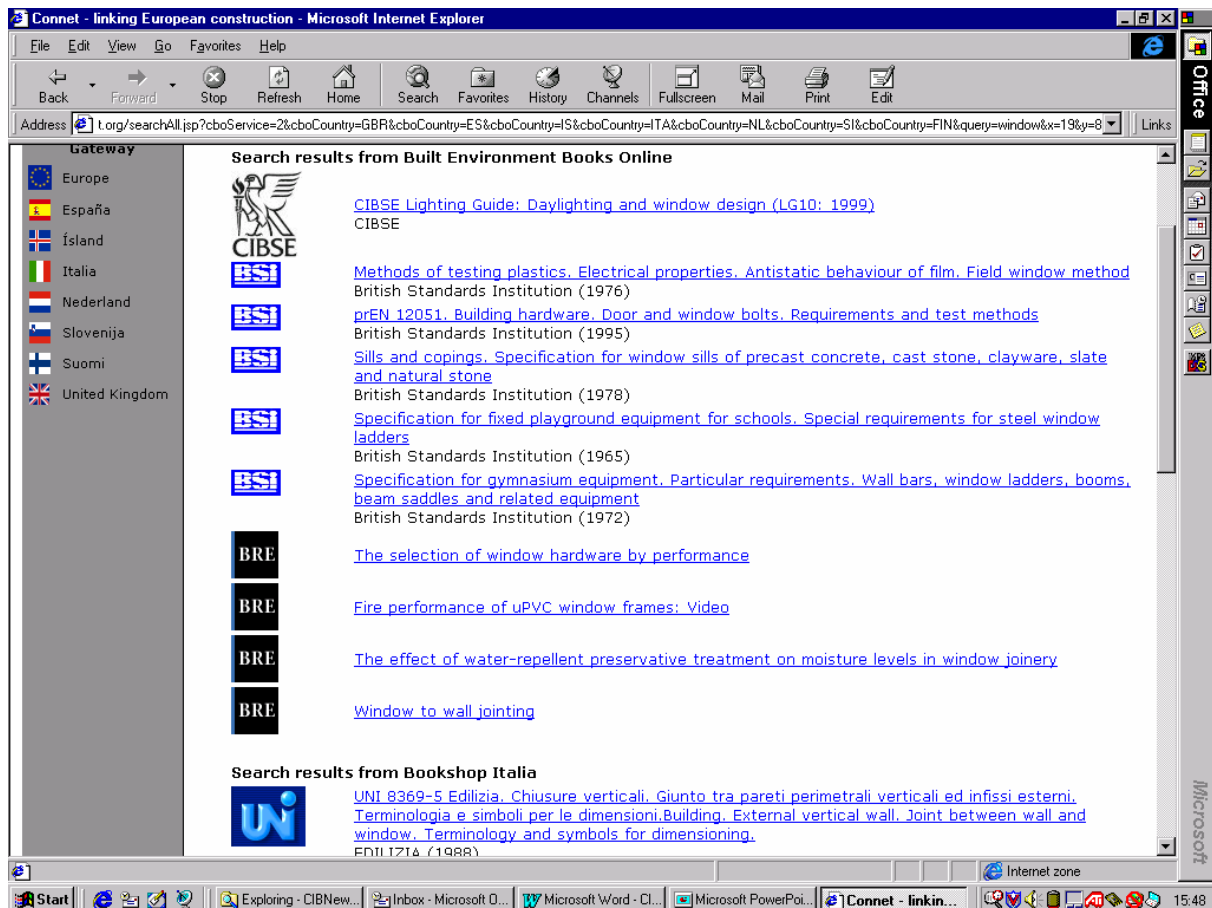


Figure 5 – Search results across national TIC services

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