Client Report :

INFORMATION SERVICES TO ENABLE EUROPEAN CONSTRUCTION ENTERPRISES

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Information Services To Enable European Construction Enterprises

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Executive Summary

Introduction, Background, Context

The construction industry is the largest industrial sector in the European Community, both in terms of GDP (11% in 1996) and employment (some 7% of working population). A recent review of the industry for the UK shows that the building materials sector and the contracting sector account for most of the GDP (2% in value-added terms and 8% respectively).

It provides unique challenges due, inter alia, to the number of SMEs (97% of construction companies have less than 20 employees), the constantly changing project-based working alliances, and the diverse nature of the participants (some dozen different disciplines).

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 finished in April 2001. It builds upon a previous EU project - CONNET (CONstruction information service NETwork).

Description of Project

The infrastructure developed under CONNET has been extended and three new types of services created. The countries participating in I-SEEC have been extended beyond the original three in CONNET to Finland, Iceland, Italy, the Netherlands, Slovenia, Spain, and the United Kingdom. Between them some thirty-five separate services have been enabled through the CONNET infrastructure. Other countries have expressed interest and additional services have been created for Belgium and Germany.

Results

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:

- 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, multi-classification support, enabling searches to be extended from the original language; permitting handling of national systems used across the EC. Thesauri are also associated with the classification services.
- Provision of centrally managed user profiles, allowing personalised delivery of updates in areas of interest
- Help desk, providing a point of contact for potential service providers and for problem resolution

The services offered by I-SEEC include Technical Publications, Manufactured Products, Signposts to Web resources, Calculation and Software, Waste Exchange, Who's Who in Construction, Specialist Equipment and Facilities and Best Practice Information services.

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 providing information to achieve performance. The range of services, along with active notification systems, help to achieve technology transfer within Europe's architecture, engineering, and construction industries.

Future Developments

Some of the CONNET services are already operating as commercial services, others will be operated with support from partners and sponsoring national bodies with a view to commercialisation in the future. It is planned to create a suitable legal body (a European Economic Interest Group) to allow continuing collaboration between the current partners and to encourage new countries and partners to make use of the tools and infrastructure developed. A plan for the EEIG has been drawn up and will be implemented by the end of the project or shortly afterwards. Proposals for extending the functionality of the manufactured product service have been prepared as this is seen as a key area of great importance for the construction industry.

Contents

1 Introduction and Background

The construction industry plays a very important role in the economic well-being of the European Union, representing approximately 11% of Community GDP in 1996. In spite of a slow-down in the rate of increase of productivity, the construction industry remains the largest industrial sector in the Community, ahead of the foodstuffs and chemicals industries, and it is crucial in producing investment goods. Construction is the largest sector in terms of employment, providing jobs for 8.8 million people (7% of the working population), and gives rise to 2.5 million construction-related jobs, and 14.3 million other service sector jobs.

However, the structure of the construction sector provides unique challenges. Chief among these is the size of the industry. The construction industry is also perhaps the most geographically diverse industry, and one that involves a very large number of small to medium sized enterprises (SMEs). EC figures show that of the 2 million construction companies in Europe, 97% have less than 20 employees, and 93% have less than 10.

The industry is also very challenging, due to the diverse nature of participants. The range of professionals on a project can easily cover a dozen disciplines, from architecture, engineering, and construction through to facility management and demolition, all with very different information requirements. The training industry participants receive ranges from professional degrees, through to a very limited amount of formal training for many construction workers with. Yet any change in the industry can impact on a wide range of these industry participants. For example, the introduction of a new material may require changes in the construction process which need to be communicated to architects, engineers, facility managers, construction labourers responsible for the practical work, and those who finally demolish and dispose of the building.

A recent report by Davis Langdon & Everest for the UK DETR (A study of the UK building materials sector – Sep 2000) found that the building materials sector contributes 2% in value-added terms to the UK economy and that over 30 separate industries are involved. There are some 15,000 producers in the UK, together with 15,000 intermediaries (distributors, retailers and agents). This is a sector with many SMEs that will face significant challenges and opportunities from the general move to e-business that is forecast. For example, a recent survey forecast that, within 5 years, some 50% of all construction transactions could be undertaken using e-commerce (Construction Products Association Special Report E-Construction: Are we ready?, CICA, 2000). Some specific challenges that this sector will encounter include: new ways of exchanging knowledge, new forms of business organisation and partnering, disintermediation, streamlined supply chains, need to add value by providing product information, guidance etc.).

1.1 Background to the project

The construction industry is perceived as being slow in its uptake of new technology and new processes. Certainly in the IT world this is borne out by recent surveys where IT expenditure per employee per year in construction (£453, ComputerWeekly 1999) is the lowest of any industry, and is considerably lower than the average (£2016). However, the use of IT is fairly high despite this, with only 1% of firms in the industry not using computers (Business and IT Survey 1999); 68% of architectural practices using CAD (AJ 1999); and 57% of firms using the Internet for business (Business and IT Survey 1999).

The Internet has been identified as a major form of dissemination for the majority of research and publishing organisations in the construction industry. This results in, for example, the majority of the 220 construction-related publishers in the UK having their own web sites. However, there is no unifying system to tie these sites together and offer their resources to the industry. The use of global Internet search engines provides little help, with extraneous and low quality information being returned along with the important information. Recent analysis also shows that the best search engine only covers 16% of the Internet's estimated 800 million publicly indexable web pages (Lawrence and Giles 1999). The top 11 search engines together cover approximately 42% of the total, so are in no way comprehensive.

Furthermore, there is a plethora of separate, overlapping and competing classification systems that apply to this domain. One important need is to reduce confusion and encourage user-friendly access to both existing and emerging information sources.

These aspects make the construction industry ideally suited to the provision of Internet-based, quality, information gateways.

In view of the rapid changes in information technology, a deliberate emphasis was placed on the use of existing methods, tools and standards. Working systems were created in CONNET and these have been improved and extended in I-SEEC.

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 finished in April 2001. Nine countries are represented in the systems developed. Over the course of I-SEEC contacts have been made with a wider number of countries and expressions of interest received. It is clear that this interest extends beyond the EEA.

I-SEEC has created a set of inter-linked national Internet gateways to quality information for the European construction industry (see http://www.connet.org/). It builds upon the CONNET initiative of DG-III ETTN (CONstruction information service NETwork, 1999) to provide the construction industry with an essential source of such information. It has created a "virtual technology park" that is accessible to the whole industry, regardless of national boundaries. The services that can be accessed from the CONNET gateways include examples both of:

- existing commercial systems (e.g. Finland's BII bookshop, Netherlands BouwOnline, UK BRE bookshop, German IRB bookshop and other services),

- newly developed systems using CONNET data structures and conventions (e.g. Belgium, Iceland, Italy, Spain)

as well as the newly developed Netherlands web thesaurus.

It is important to understand that the CONNET philosophy is NOT to create a single portal and attempt to attract all users to it. This would be unrealistic, anti-competitive, difficult to manage and would make tailoring and branding to suit local user preferences and contexts more difficult. Rather, the aim has been to allow separate portals to add value for local users by implementing a certain level of open interoperability between them. These portals could be at a national level or at a trading community Extranet level or, indeed, at a company Intranet level in principle.

A further important consideration has been to encourage long-term viability of the systems. It has been an objective of the project to both set up new services and to test and implement business models for each service so that both operators and users can continue to benefit from them once the I-SEEC project has been completed.

The UK's Building Research Establishment (BRE)[1] is the main contractor for the I-SEEC project with partners: BII (Finland), VTT (Finland), BCRM (UK), IBRI (Iceland), IBIC (Iceland), GCS (Slovenia), IKPIR (Slovenia), IETcc - CSIC (Spain), ICITE (Italy), and TNO (the Netherlands). Additional services were created for Ministère de l'Equipement et des Transports (Belgium) and Fraunhofer Institut für Raum und Bau (Germany) through informal co-operation. This demonstrated the practicality of adding new national versions of the CONNET services, further national gateways and interfacing to other commercial systems.

1.2 Related initiatives and parallel developments

The CONNET portal was inaugurated under the ETTN portion of the EC's European Technology Transfer Initiative. Within this context it aimed to provide mechanisms to engender greater technology transfer within the architecture, engineering, and construction (A/E/C) industries. This was achieved to a large extent by providing access to the European A/E/C knowledge base through uniting information resources across Europe, and instilling active notification processes for industry, working across this knowledge base. During the initial CONNET project the CONNET system was linked through the central ETTN Internet system to allow their technology transfer agents access to this resource in pursuit of their objectives for technology transfer.

The broadening of the CONNET system in I-SEEC, in terms of the types of services offered and the countries that have implemented each of the service types, has increased the utility for ETTN participants. Access to best practice information, who's who in construction, and specialist equipment are all important new resources for those involved in technology transfer within A/E/C domains. Equally, the expanded access to information from several European nations provides a greater range of sources for potential solutions to enable technology transfer. This additional ability is automatically

[1] See Annex H for full list of abbreviations and acronyms

available to the ETTN transfer agents through their links to CONNET systems from their Internet resource database.

1.2.1 Commercial Construction Portals

Over the period of the I-SEEC project there has been intense activity both at commercial and research levels to develop portals for A/E/C (Architecture/Engineering/Construction) and the infrastructure that would support them. In this section we review the work in this area, compare to the I-SEEC initiative, and show where synergies exist between the differing initiatives.

Many construction portals have been launched in Europe over the last two years, in line with similar trends across all industries. Several of these portals failed within a short period of time indicating the tight marketplace within which they are competing, and the lack of known business models for successful systems. The portals that have been launched generally fall into two categories - those based around manufactured products, and those that support project participants. Portals in these two categories are discussed below.

Portals based around manufactured products form the majority of existing portals. In general they tend to duplicate paper-based catalogues, in several cases to the extent that they scan paper-based catalogues to provide their service. The benefit of this approach is fairly low; the only added benefit over a paper system (assuming that speed of access to information is fairly comparable) is that updates are immediately visible to all users. Some portals are enabling e-commerce for purchase of selected products, and a very small number are providing for selection of products based on their performance attributes. To augment these services the portals often tie in a selected set of related information services, for example, links to Standards documents, industry news feeds, and databases of selected professionals in the industry. A major criticism of these sites is that they lack comprehensiveness. This is often true even for their major information content (i.e. manufactured products), but more especially true for their associated services, which tend to have a minute portion of the information available to the industry.

Exemplar systems in this area include:

- Bricsnet (http://www.uk.bricsnet.com/) provides a portal to manufactured products which has been established in six European countries, they offer project management tools, CAD tools, real-estate life-cycle management, and bidding and procurement modules;
- BuildOnline (http://www.buildonline.com/) provides a portal to manufactured products operating in seven European countries, they offer project management tools, news feeds, tendering, and procurement modules;
- b2build (http://www.b2build.com/) provides for trading, consulting, and catalogue management within three European countries;

- BuildingWork (http://www.buildingwork.com/) provides a portal to tradesmen, construction industry professionals, tendering, estimating, procurement, planning, and project management;
- HouseBuilderXL (http://www.housebuilderxl.co.uk/) provides house builders access to merchants, software, advice, quotes, as well as manufactured product information;
- Interbat (http://www.interbat.com/) provides access to CSTB publications and information resources, construction library, along with manufactured products;
- BatiWeb (http://www.batiweb.com/) provides access to industry professionals along with the manufactured products;
- ASCWebIndex (http://www.ascwebindex.co.uk/) purely provides manufactured product information.

Portals based around project information management provide a service to industry by enabling virtual teams to be formed from all participants in a project where project documents are shared between participants in a very immediate fashion. These portals also tend to offer associated services along the same lines as the manufactured product portals and with the same deficiencies.

Exemplar systems in this area include:

- services from IntraBouw e.g. BouwDesk (http://www,bouwonline.nl) a virtual office web site,
- Mercadium (http://www.mercadium.com/) a portal for project management in five European countries, along with procurement, catalogues, auctions, ask the expert, and legislation and regulations;
- Citadon (http://www.citadon.com/) a suite of integrated services allowing bidding, reprographics, and some financial services on top of its project management suite;
- the BIW (http://www.thebiw.com/) news and industry information alongside the project management services;
- Buzzsaw (http://www.buzzsaw.com/) virtual meetings, bookstore, design tools, reprographics, and quote management on top of its project management suite;
- Cadweb (http://www.cadweb.co.uk/) and
- I-Scraper (http://www.i-scraper.com/) project management.

CONNET aims to demonstrate how such services can conveniently be linked together and mixed and matched to suit individual users' requirements and preferences.

CONNET is significantly different from the above because it is not one company; rather it is an infrastructure to support collaborating portals. It adds value at a low budget. In fact,

the I-SEEC project has allowed new services to be created using the CONNET infrastructure at much reduced cost.

1.2.2 EC Projects

Currently, there are very few EC projects underway which impact A/E/C and the Internet. The recently completed project GENIAL demonstrated a framework for service interoperability. The commercialisation of their results for multi-marketplace developments is still awaited to enable decisions to be made of their applicability to the CONNET system. Aspects which have been commercialised (e.g., database-driven web service enabling) are more appropriate for stand-alone services than for the gateways that CONNET supports.

One currently running project is eConstruct (Electronic Business in the Building and Construction Industry: Preparing for the New Internet) which:

> *" aims to develop, implement, demonstrate and disseminate a new Communication Technology for the European Building-Construction industry, called Building-Construction eXtensible Mark-up Language (bcXML). This Communication Technology will provide the European Building and Construction industry with a powerful but low cost communication infrastructure that:*
>
> - *Supports electronic business between Clients, Architects and Engineers, Suppliers (of components, systems and services), Contractors and Subcontractors,*
> - *Is integrated with eCommerce and Design/Engineering applications, and*
> - *Supports virtual construction enterprises over the borders of the individual European member states."*

Their bcXML and bcTaxonomy development that is based on the GENIAL approach could be linked with some of the CONNET services as a further classification item. eConstruct and I-SEEC are aware of each other and some discussions have been held to discuss the use of bcXML in I-SEEC and I-SEEC as a demonstration of the utility of bcXML. A proposal to further develop construction product information services is currently being prepared that would establish a collaboration between CONNET partners and eConstruct.

1.2.3 Ongoing Standards Development

A range of Standards activities is ongoing in the A/E/C domains at the present time. Of relevance to this project are the data models under development by the IAI (which are now appearing in commercial CAD systems) as well as the XML initiatives. These data models allow for the transfer of detailed building specification and configuration information along with particular processes in the domain. For the majority of services in the CONNET gateway these structures have little bearing. The main exception being in the manufactured product area where the IAI's IFC data models provide the basic structures required for the representation of this information. However, the structures used in this project to represent documents, organisations, cost models, etc are closely aligned with those of the IAI and XML developments. The models utilised are usually derived from non-construction-specific standards organisations such as W3C (e.g. the

Dublin Core definition which has been utilised for the technical information centres). The XML developments (e.g., aecXML, bcXML, designXML) basically provide for process representation and categorisation of information from the A/E/C domains. This is currently supported by the classification structures within the CONNET data models. The API invocation mechanism within CONNET is specified in such a way that these standard representations can be supported in future versions. For example, whilst a response mechanism of 'text' is usually specified in the API system, this is extensible to response types of XML or IFC which would enable structured data to be returned from these services.

1.2.4 E-commerce initiatives

There are many e-commerce initiatives attempting to provide the winning framework for the e-commerce revolution. Currently, it is uncertain which of these frameworks will be successful (if any) and I-SEEC along with many other projects awaits a clear leader prior to committing to a particular framework. The I-SEEC team has sought to maintain awareness of the progress that is being made and to learn from this. For example, in the eCo framework (http://eco.commerce.net/) there is provision for resource discovery through a protocol by which e-commerce systems can describe themselves and their interoperability requirements.

2 Description of the project

CONNET's main deliverable is a set of interoperating web sites, which includes a central European Gateway. It is not essential for users to enter the systems through this gateway.

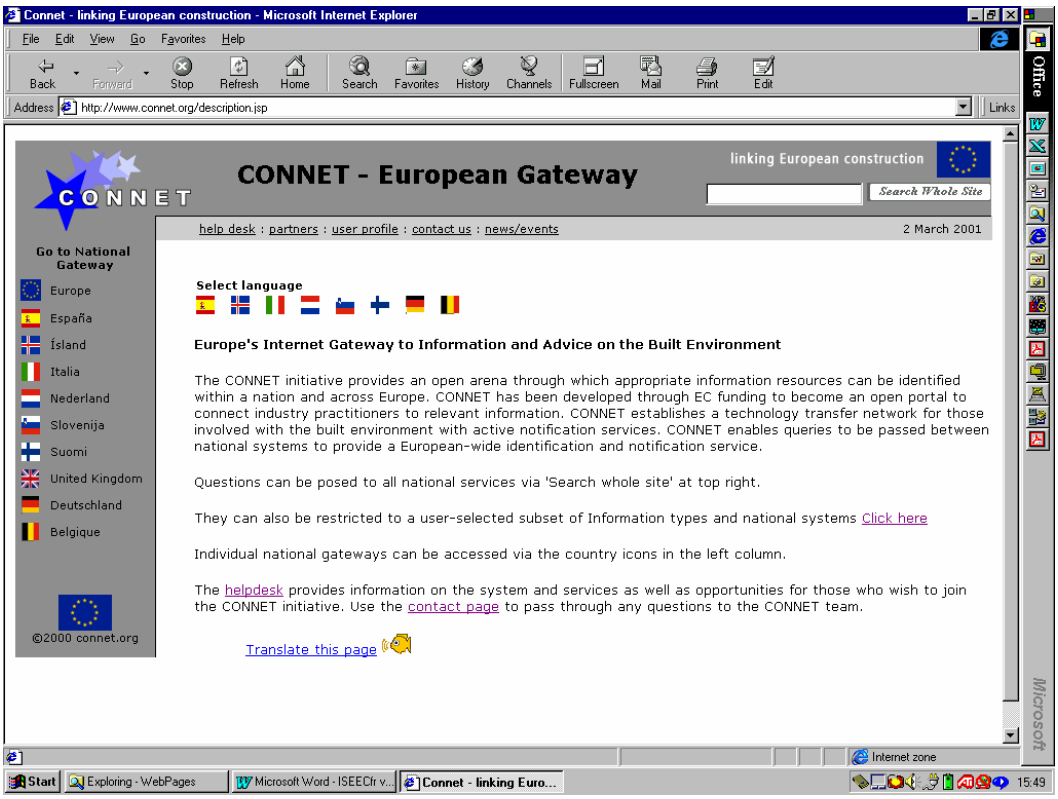
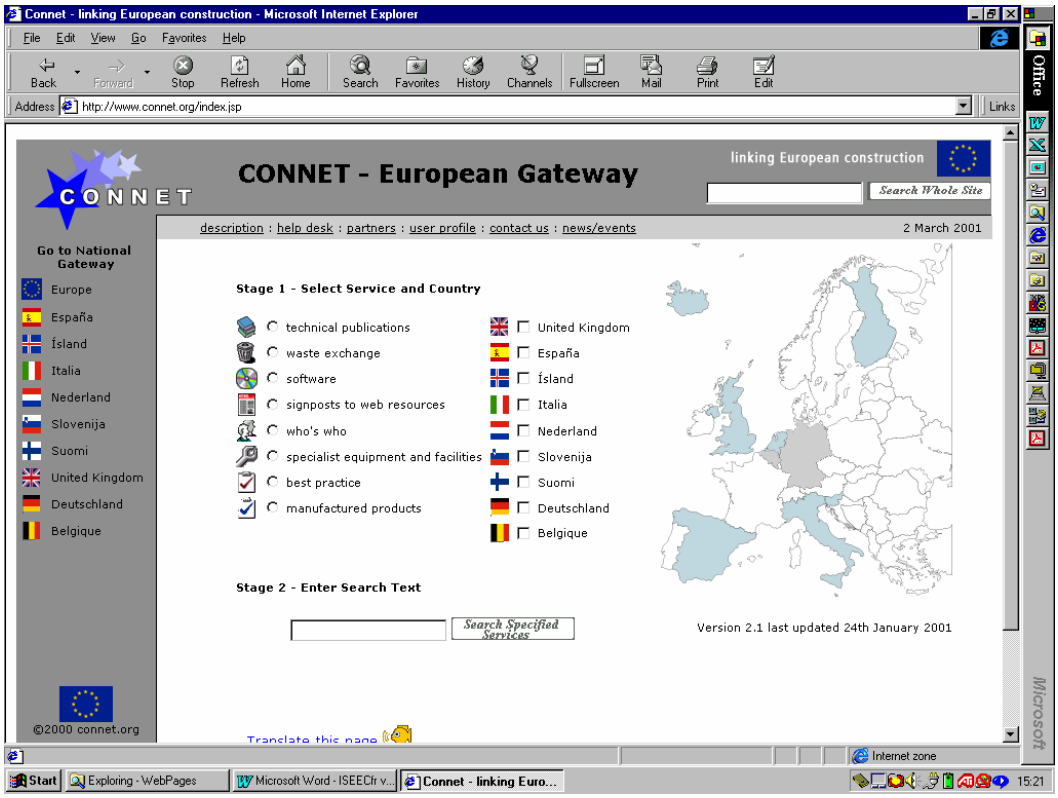


Fig 2 European Gateway web page

There are eight different types of service offered by I-SEEC, each dealing with different information types:

• Best Practice Information services	• Specialist Equipment and Facilities
• Calculation and Software	• Technical Publications
• Manufactured Products	• Waste Exchange
• Signposts to Web resources	• Who's Who in Construction

They include both existing legacy, commercial systems and new ones developed from scratch within the project. More than 35 services can be accessed from the CONNET sites.



Section 2.1 describes the types of system at a fairly general, non-technical level to give an overview of the usability of such systems, illustrated with examples where appropriate. Section 2.2 then gives more detail on what each participating country has developed for each of the services. A more technical description is given in Section 2.3, which is intended for those who wish to understand the technology better or who wish to implement new services.

2.1 Non-technical overview

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 (DM) and interfaces (API) have been devised for all the services, using existing standards where possible. These are documented in a separate report (Hutchison 2001) that is available from the FTP site for the project (www.connet.org). 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 2 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.

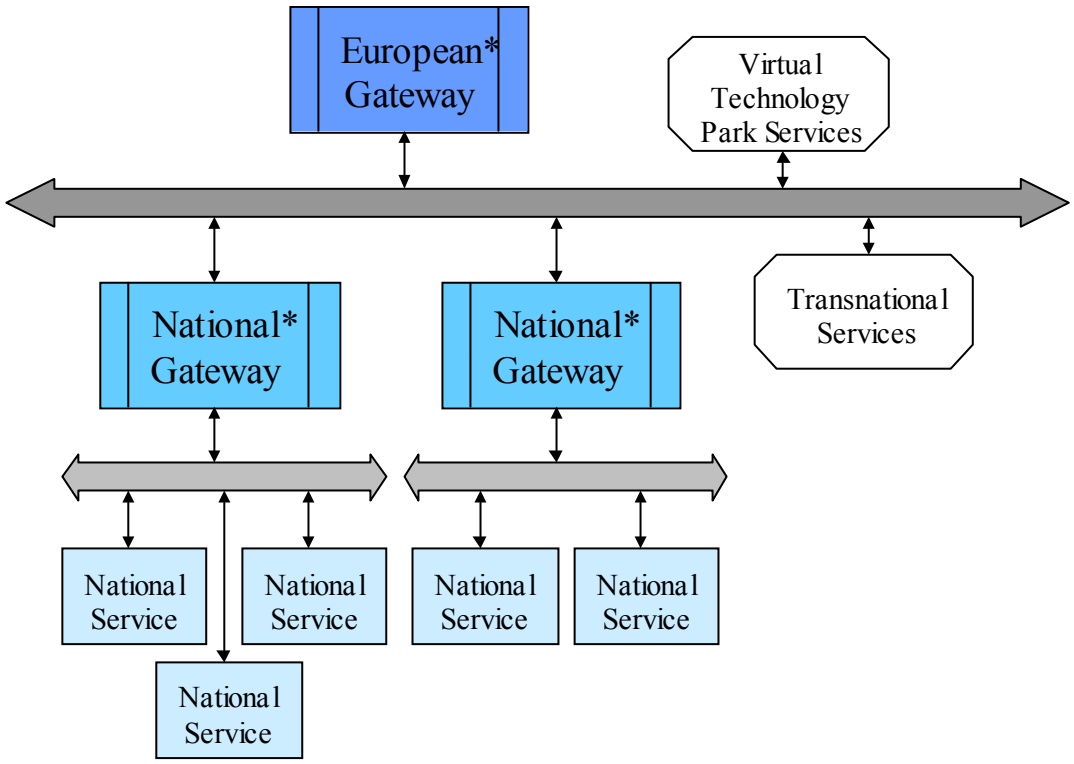


Figure 2 – CONNET Gateway and Services Infrastructure

(*Note that terms European and National reflect the current implementation – the same model would hold both for a more global Gateway including non-European organisations and for more local services implemented as an Intra- or Extra-net for trading partners in a supply chain – see below)

Some of the systems enable e-commerce transactions to be executed and appropriate security systems have to be implemented. For example, 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 3 for a generic national infrastructure).

The concept implemented could easily be extended to provide access to a wider set of services from other, non-European organisations. For this the 'European Gateway' would serve as a more global main Gateway to all of the other Gateways. These could, in fact, extend down to more local services operated within a set of co-operating trading partners (Extranet) or even an individual company's Intranet. This is an important aspect of the design as product manufacturers and others are facing increasing globalisation, mergers and the establishment of new trading partnerships in an effort to improve competitiveness and increase added value to customers.

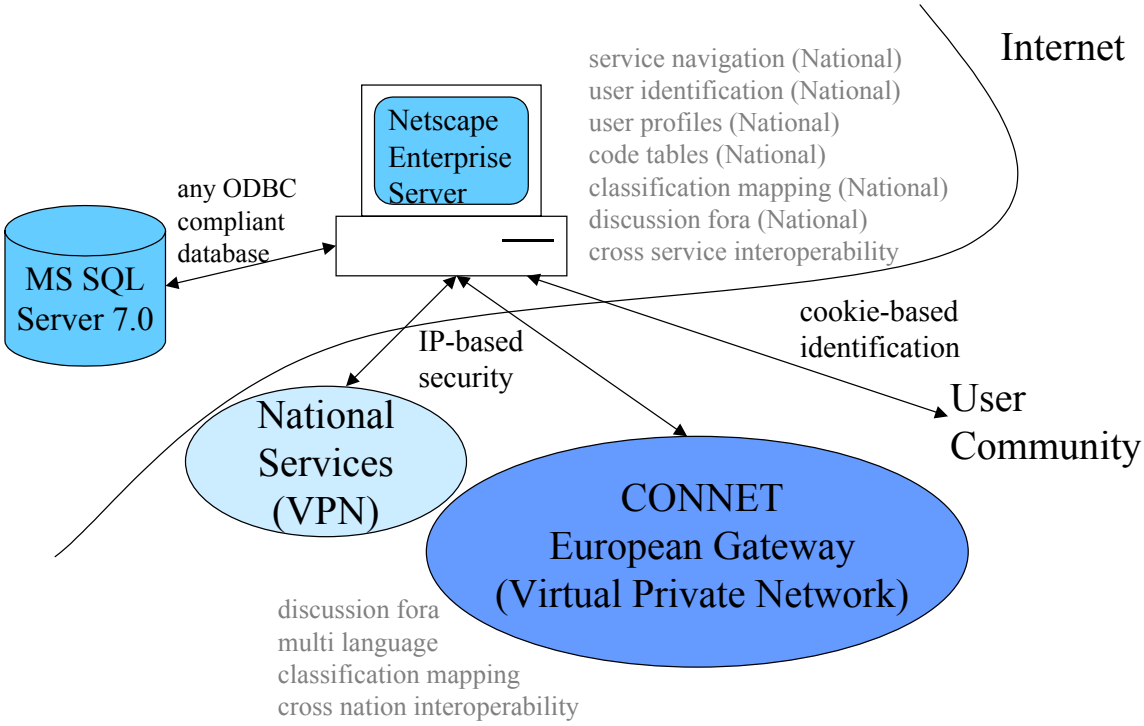


Fig 3 Generic infrastructure

I-SEEC aimed to develop a set of IT tools that were consistent across services and national gateways. It is important to note that there are two main classes of users. The first, and largest, class will wish to look for information pertaining to their own national context and language(s). The second class consists of more "European" users that wish to find information for countries other than their own and that are likely to be produced in the local language(s). The current systems allow CONNET/I-SEEC partners to decide which services would be of interest to foreign users and the former were responsible for developing the most appropriate language interfaces and content.

An important development that has taken place within I-SEEC is the creation of an online thesaurus tool that can work behind the scenes to add synonyms and to provide translations, both for natural language words and for classification terms. It is expected that this will be a significant help for the "European" users described above.

2.1.1 Technical Publications and Bookshops (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 original CONNET service – the BRE bookshop service - is a 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. This has been extended significantly and had a major redesign during the course of this project. Agreement has been reached for this to be incorporated into a major UK construction portal. It will replace their existing system and is recognition of the quality of the system.

Comparable Dutch, Finnish, Icelandic, Italian, Slovenian and Spanish services have also been implemented and a link made to a commercial Dutch system.

A user can request that information be obtained from either the national service or from the other fully integrated systems from other countries. Synonyms can be provided from an on-line thesaurus that allows a degree of multi-lingual operation.

The German organisation Fraunhofer Institut für Raum und Bau has recently launched a set of online services that includes a full e-commerce publications service. BRE and IRB have successfully used the IRB database to create a fully compatible CONNET version of this. It provides a convenient additional route to identify and order German language publications.

Overall over 50,000 publications in more than nine languages are accessible from the CONNET systems. This number is still increasing as additional publishers are joining. This forms an extremely valuable repository of information that is otherwise often very hard to locate. It is expected to be of great value to practitioners across Europe and should lower barriers to cross-border work and co-operation. For example, the BII web bookshop is divided into Finnish and English services. The Finnish bookshop aims at the Finnish market and provides some 2000 titles in 12 different languages. The books in their English bookshop are in English or are partly in English. The VTT bookshop also provides an English language service. It has some 3000 publications in several languages altogether.

In some systems users can establish interest profiles for automated notification of new information in their areas of interest. The automated notification service has not been fully implemented in the Icelandic gateway. Instead, the user is notified on changes as he logs into the Icelandic gateway. This method is sometimes preferred by users over push notification as the latter can produce too many messages and lead to information overload. This illustrates how the services can be tailored to suit the intended local market.

2.1.2 Internet Signpost (Electronic News) Service for Europe

This service is an Internet-based system, similar to AltaVista in operation, for closely targeting information at specific users in the construction domains.

The UK service has created an index of some 20,000 important construction-related web sites, including commercial organisations in construction, from the UK and other largely English-language sites. It utilises lists collated by a wide range of more domain-specific indexes already on the web (e.g., EEVL, CEL, Yahoo) to provide a comprehensive index for the whole industry. The collated sites are classified by type of information, type of organisation providing the information (quality measure), as well as keywords about the site.

For some countries more targeted national web search facilities (selected by the project participants) have been implemented (Finland, Iceland, Italy, Netherlands, Spain) and these can either be searched individually from the national sites or by selecting a subset of them from the European Gateway.

A ‘push technology’ facility has been added to the UK service 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.

The service is fully integrated with CONNET tools, utilising the thesaurus to expand user searches, as well as the user profile system to enable search profiles to be stored and periodically run automatically to inform users of news in their areas of interest. New sites are added daily to the service, increasing its coverage.

Although Internet-based news is of lower overall quality than a grouping of tightly controlled publishers, there is still a wealth of information available in this form. This service ensures that information specific to the built environment from across Europe and the world is made easily available to the whole industry. Surveys have shown that the main Internet search engines are failing to provide comprehensive indexes of the Internet (the best search engine covers approximately 16% and the top 11 cover approximately 42%, Nature, No. 6740, July 8 1999, pp. 107-109). It is therefore

appropriate that domain-specific initiatives such as CONNET provide a more comprehensive view for their industries. These services provide a comprehensive resource for the industry, with a wealth of built environment-related web sites linked to its indexes.

2.1.3 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 single central, international 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.

To our knowledge this service provides the most comprehensive library of A/E/C software compiled and made freely available for browsing and searching on the Internet. It contains information from over 1200 vendors from 78 countries and has attracted 10,685 unique visitors since December 1999, with 570 new visitors during January 2001.

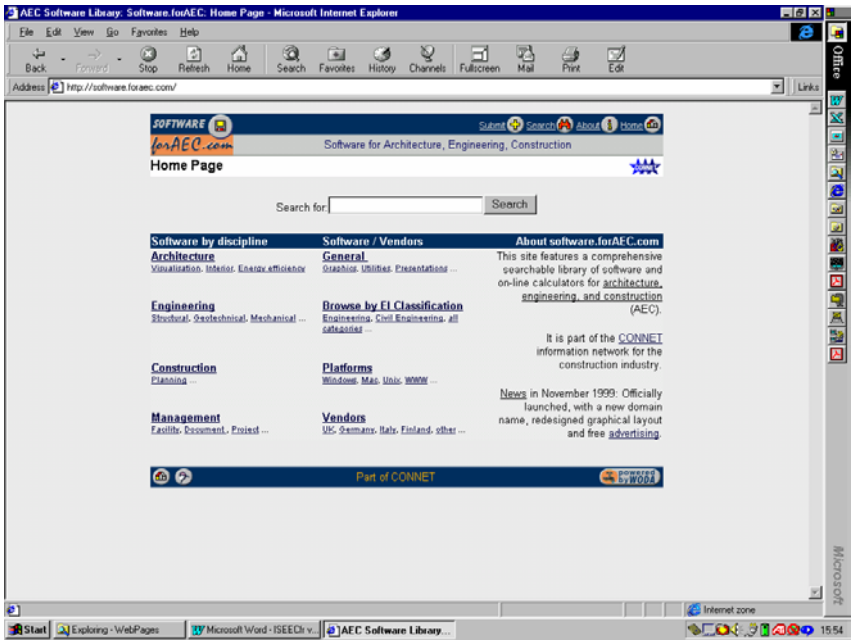


Fig 4 Calculation and Software Entry screen

2.1.4 Waste Exchange (Materials Interchange) Services

These provide a service to match waste or excess construction material to potential users for recycling. There are already some services in Finland, Iceland, Netherlands UK. Slovenia has set up a service but there is little data in it currently.

Experience to date suggests that more time is needed before such systems are likely to be really successful. For example, there are three independent online exchanges in the Netherlands with a mixture of membership fees and pay-per-use models (http://www.ngbb.nl, http://www.reststoffenbeurs.nl, http://www.andernet/bouwbank). A number of private demolition companies in Netherlands offer material on their sites. There are currently still terminology issues that cause problems.

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 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.

The Waste Exchange Centre provides a valuable resource to a small portion of the whole construction process. However, the impact of this process on the environment can be quite major and causes major problems (health and safety, cost, image, etc) for the industry. This service addresses both national and European goals for waste reduction and recycling in the industry. It is usable by a large number of practitioners in this field (57% use the Internet for business) and with the automated notification services provides a quick method to identify recyclable waste or find a recipient for excess and demolition materials.

2.1.5 Manufactured Product Service

A Finnish Manufactured Product Service providing information about building materials and products available in Finland was implemented under CONNET. It contains Finnish as well as imported products. The information provider pays for the product sheets. There are different levels of access whereby users can see more/less information. I-SEEC has enabled the CONNET prototype to be developed into a commercial system. The service was launched on 16 Jan 2001.

There are now two services:

- the original CONNET database in English; this was created initially as a demonstration model, but is now being considered as a possible Finnish service for foreign customers; it can be used free of charge and may be developed further in the future.

- the new domestic service in Finnish, which was launched in January. There are two levels of access. A user who wants to use the whole database has to register. If a user doesn’t register, he can still obtain access to the information about those products for which a product sheet exists. A registered user gets access to the whole database containing information about the products and manufacturers. He also gets access to the product sheets. There are a little more than 400 out of 1000 on the web at the moment and the amount is increasing all the time. The manufacturers pay for the product sheets. Once a user has registered, he is charged a yearly subscription fee; an invoice is sent by snail mail. If he fails to pay, his access will be closed.

In the original CONNET service that is still running, every user gets access to everything free of charge, but as the service is in English, there are only the product sheets for which English versions exist. The numbers of products and manufacturers are about the same as in the Finnish service.

It is possible to use the thesaurus developed in I-SEEC to locate products and producers in linked catalogues. Synonyms can automatically be added to a search for the Talo 90 classification system (Dutch, English, Finnish, Italian) and CPV (8 European languages). This makes the products easier to find and adds value for the user.

It should be noted that the database provides contact information for practically every building product on the Finnish market - some 18,000 products and 2,500 manufacturers (including the classification of the product and contact info for the manufacturer or distributor). The number of product sheets is 400 currently and this is expected to grow to 800 within a year. This will mean that the existing paper-based product will have been completely transferred into a digital service.

The MPS is one of BII's most important products and further developments are being actively considered. These include a standardized interface for product information based on the IAI's IFC definitions, support for building specifications, inclusion of additional product information.

It will be of significant importance to ensure that there is easy access to product information on environmental issues, CE-marks etc. and the CONNET services are well positioned to enable rapid, up-to-date provision of such information to users throughout Europe and further afield, thus facilitating cross-border trade.

In fact, CE marking means for many products a single certification of the product to enable the product to be put on the market in the whole European union. There is an important and increasing demand from notified (certification) bodies as well as the European industry for a European wide database of all CE marked products, containing all the information of the product of relevance for CE marking, commercial information and so on. Once harmonised European standards become available, ALL construction products will have to be CE marked as a legal obligation.

2.1.6 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 whom 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 that is widely available to the whole industry linking location, skills, recent projects undertaken, certifications, etc is not generally available.

CONNET 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. The CONNET services contain information on organisations from all partner countries. It is expected that more data on individuals will be added over the next year as renewal letters allow explicit consent to be obtained.

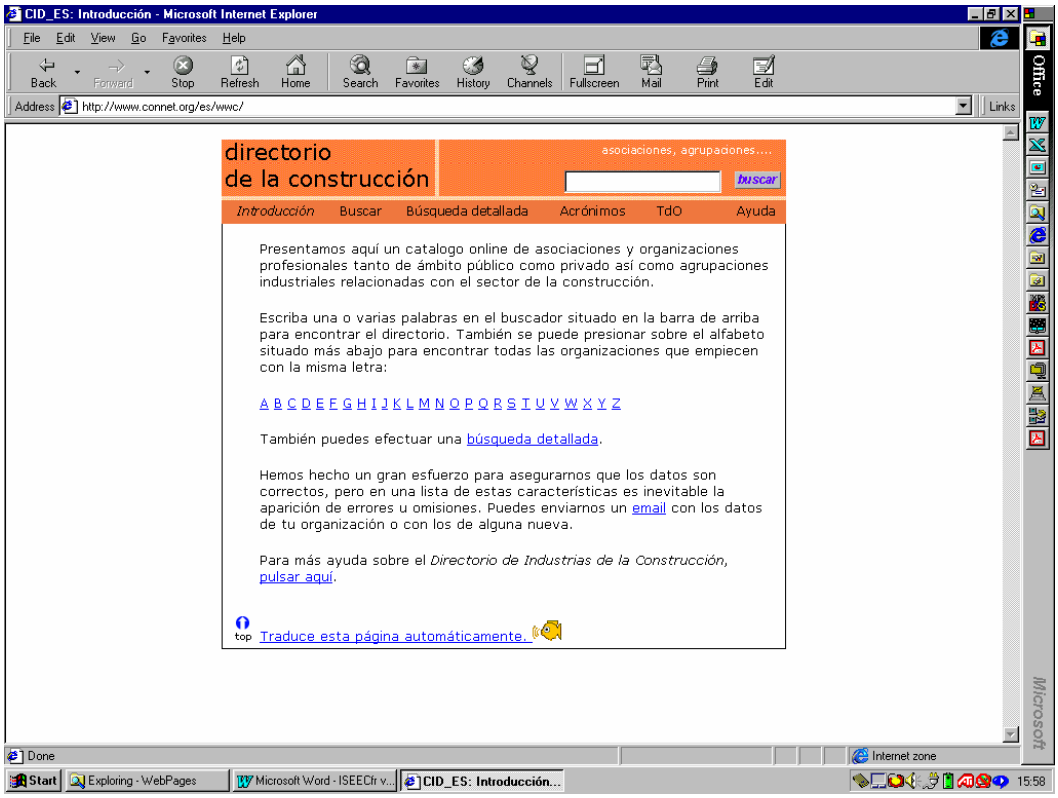


Fig 5 Who's Who service for Spain

2.1.7 Specialist Equipment and Facilities Services

This service allows the user to identify suppliers of specialist equipment and facilities based on their needs. It could provide a more intelligent search, and more complete information, than is currently available from paper-based catalogues or their electronic counterparts. Once the suppliers of equipment are identified this service can provide online purchase or lease in association with the supplier. Within I-SEEC, these services have been populated with information about services and specialist facilities from the participating organisations (e.g. large burn halls, strong floors, etc.). Extension of this to external organisations could be explored as a future development. The systems are now in place to do this.

2.1.8 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 Finnish and UK services have been integrated into CONNET and links made to the Slovenian Quality Mark in Construction project. The latter describes the assessment procedure and some best quality products/services in Slovenia – some 100 companies and products that have been awarded some recognition.

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. It is expected that the thesaurus will prove very helpful in allowing such information to be made available to a wider group of construction professionals.

2.1.9 Core services – virtual technology park

CONNET provides a range of services, the majority of which are invisible to users that are equivalent to the infrastructure services one would expect in a physical technology park. The available technology park services are listed here with a more detailed description given in 2.3

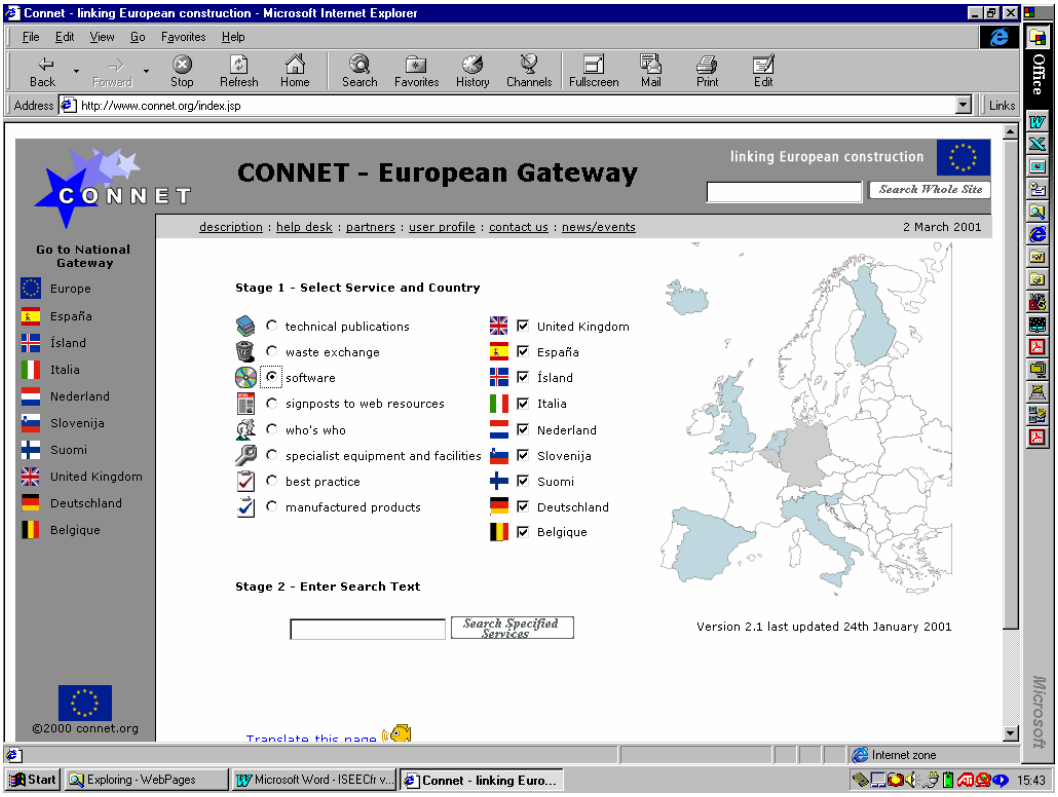
Provision and maintenance of the required infrastructure.	Management of security services.
Provision of a help desk.	Provision of across-service communication
Provision of classification code support.	Management of a user identification system.
Provision of thesaurus tools which allow any system to find related words for a set of user-specified words	Provision of language translation services through outsourced systems (e.g., Babelfish from AltaVista)
Management of discussion fora through a database-driven system	Provision of standard code tables for services to incorporate.
Provision of an information broker role enabling transparent access to information in the CONNET services.	Management of inter-service communication. CONNET maintains directories of all services that are linked in. This allows all comparable services to be identified and for a message to be passed from one service to another
Monitoring of services and gateway nodes	

2.2 National Services

It is worth repeating that the CONNET model is to encourage separate gateways/portals and add value for the user by enabling interoperability between them. This is in contrast to the more normal approach of trying to persuade all users to enter the virtual knowledge base through one entry point. The ease with which new services could be set up for new partners (Belgium and Germany) showed the advantage of defining data structures and APIs.

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 their own national gateway.

A summary of the services being created for each country follows together with information on how I-SEEC has contributed to the national work.



Country	Partner	Services	Contribution
Finland	BII, VTT	BP,MP,N,Pub,(WM soon),WW	I-SEEC enabled substantial acceleration; likely to lead to WM service
Iceland	IBIC, IBRI	E,N,Pub,WM,WW	I-SEEC has enabled a range of services to be set up that are integrated through common data models and APIs that would otherwise not have been developed
Italy	ICITE	E,N,Pub,WW	I-SEEC enabled services to be set up much faster; would not have happened otherwise
Netherlands	TNO, IntraBouw	N,Pub,WT,WW	I-SEEC stimulated effective co-operation with the Dutch organisation BAS, promoting unified terminology
Slovenia	IKPIR, GCS	BP,CS,E,MP,N, Pub,WM,WW	I-SEEC triggered the development of single point of entry to several information services in Slovenia and caused the consolidation and co-operation among them.
Spain	IETcc CSIC	N,Pub,WW	I-SEEC enabled services to be set up much faster; would not have happened otherwise
United Kingdom	BRE	BP,E,N,Pub,WM,WW	CONNET / I-SEEC developments underpin BRE services

Key:

BP	Best Practice	N	News or Signpost to web resources
CS	Calculation Software	Pub	Technical Publications
E	Specialist Equipment and Facilities	WW	Who's Who
MP	Manufactured Products	WM	Waste Materials
WT	Web Thesaurus		

2.2.1 Technical Publications and Bookshops (Technical Information Centres)

Bookshop services are available from all countries. The idea of a common registration service and facilities to order e.g. a publication form the UK site through the Icelandic service was discussed but decided to be impractical for the moment. The BII concept of using an online service to publicise the most important internationally interesting publications as an addition to an existing physical bookshop is an example of one of the different approaches taken.

The Dutch, Finnish (from both BII and VTT) and Slovenian ones provide access to existing commercial systems. The Icelandic and Italian services have been developed to be fully compatible with CONNET, while Spain has both linked to existing services and developed a new CONNET one for IETcc publications.

Finland

BII and VTT publications are available through the CONNET site. The Finnish Technical information Service at VTT is fully integrated into the CONNET services, so that queries can be passed to or from it. This allows searching for both BII and VTT publications.

Iceland

The Technical Publications Centre (TPC) was initially launched in September 2000. The Technical Publication Centre conforms to the CONNET data model and API specification. It's functionality has been improved and refined. The centre provides functions at two levels, a) for users searching for technical publications and b) for publishers entering and maintaining information on publications in the TPC database.

The set of functions available to users in the Technical Publication Centre include the following:

- Quick Search: users can search the publication database based on a keyword from any web page in the centre.
- Search Form: allows the user to specify search terms for a number of database fields, such as title of a document, author, publisher etc.
- Extended searches: allows the user of the TPC to a) extend searches to other centres registered in the CONNET IS gateway. b) extend searches to other TPC centres registered with the CONNET European gateway for searches across Europe.
- Browse: a list of publishers available in the database and navigate to their publications.
- Shopping service: allows a user to place an order for a publication on-line. The order is processed by the TPC and passed to individual publishers for order processing. For the moment the TPC does not handle credit card processing, but this will be added later.

- Registration service: allows a user to register with the CONNET gateway as well as to maintain the information entered by the user at any time.
- User Profile Service: once registered, users can create and maintain user profiles of searches and can request notification on new and updated material as it becomes available.
- User Account Service: once registered, users can view the status of their business account and track the state of orders as well as maintain billing, shipping and payment information.

Navigation of material in the centre will be further refined by adding a table of content (ToC) for users to browse titles by category.

Functions available specifically for publishers in the Technical Publication Centre are password protected and include the following:

- Update and maintain information in the TPC directly through forms available on the web-site. Any publisher has full control over his information stored in the TPC database.
- Batch processing of publications. Special tools specific to each publisher handle updates of the meta-data database.
- Register Interest and request to join form.
- Centrally managed username and password facility specific to publishers.

In the Icelandic system the automated notification service is under the full control of the user. The user can configure the notify service either to be passive and bring up the notification of changed profiles as the user logs into a service (NOTIFY ON LOGIN) or he can specifically choose to be notified by e-mail at selected intervals by the automated notification service. The Icelandic gateway is configured to be passive by default (i.e. no notifications are sent to the service users unless they ask for it). The system notification of changes are brought to the user's attention as he logs in or when he lists the profiles he has stored within the system upon his last visit are marked changed for easy identification of new and updated material. The change status is updated as seen by the user on an update command issued by the user.

All information on IBRI documents (400) were transferred to Dublin Core format and inserted into the TPC database by the Meta-Data (MD) transfer tool. This tool also provides for future updates of the database and insertion of MD information on individual documents.

The site is being introduced to a number of interested parties and government organisations. These include the Technology Institute (150 publications), universities, the National Standards Institute and several other publishers of construction-related material.

Italy

An Italian service has been set up at BRE using data supplied by ICITE. This is the first to be realised in the sector and has served to raise interest in Italy. About 3,000 publications of the main Italian publishers of the sector have been submitted to date. By April 2001, an e-commerce service will be hosted in Italy.

Netherlands

The existing Dutch pre-commercial, cross-publisher service can be accessed through the CONNET site (or directly through http://www.bouwonline.nl). It contains some 400 publications, including CD-ROMs and videotapes.

It has not proved possible to fully integrate this with the other systems due to administrative changes in the various organisations involved. Once these changes have taken effect, it is intended to perform the integration. It will be necessary to take account of the individual institutes' desire up to now to maintain their own particular 'styles'.

Slovenia

A Slovenian technical information centre was added to the national CONNET node. The service was embedded into CONNET Slovenia as a part of ongoing agreements with the national COBISS system, a virtual library system for Slovenia. The functionality of the service includes search by authors, title, publication year, language and type of material. An English interface as well as a Slovenian interface is provided. It covers all types of publications that are available in any library in Slovenia. The CONNET API has been implemented so that COBISS can be searched from CONNET. There is no intention to sell publications for the moment.

Spain

A Spanish service has been set up with all the construction-related publications for that country. This uses existing databases covering books, monographs, manuals, doctoral theses, journals, codes etc. It can be accessed from the Spanish gateway currently hosted by BRE. It is split into 3 parts: IETcc-CSIC Publications, IETcc-CSIC Journals and Others (ISBN, TESEO, CINDOC, AENOR). The search facilities are split into separate IETcc and CSIC publications for commercial reasons.

The titles available from IETcc were used to populate a database compatible with the I-SEEC search engine so that they could be accessed through the interoperable CONNET services and access is retained to the earlier Spanish service through a link from CONNET pages (IETcc Publications). Purchase of these publications, as well as the Journals, must be done using the e-mail of fax order included on these pages.

The Spanish service included also links to other existing databases that are the property of the Ministry of Education ISBN or TESEO (about 10,000 construction-related references). The functionality of both non-commercial services includes: search by authors, keywords, titles, year of publication etc. A link to AENOR databases containing Regulations, Standards etc. with its own commercial model is also included in OTHERS.

IETcc's status prevents selling publications from other organisations. Plans for including AMIET publications are being considered for the future.

UK

The UK BREBookshop system went live in April and has attracted users and on-line purchases. It has undergone a major re-design following initial experience and is now more tightly linked to the main BRE web site. The new version was officially launched at the end of September with a more comprehensive list of some 30,000 titles from c 50 built environment publishers including BSRIA, CIRIA, the Stationery Office, CIBSE and BRE. The service is becoming increasingly useful with sales doubling since launch; they are currently running at c. 70 per week.

BRE has entered into an agreement with EMAP's Construction Plus portal (a major industry portal, being home to the electronic versions of Construction News, New Civil Engineer and the Architects' Journal) - the BREBookshop.com web site is now the official Construction Plus internet bookshop, replacing their existing product. They have described it as the leading [UK] online bookshop for the built environment. (See www.constructionplus.co.uk/constructionplus/asp/home.asp, www.bre.co.uk, www.brebookshop.com/)

Germany

The German organisation Fraunhofer Institut für Raum und Bau has recently launched a set of online services that includes a full e-commerce publications service. BRE and IRB have successfully used the IRB database to create a fully compatible CONNET version of this. It provides a convenient additional route to identify and order German language publications.

2.2.2 Internet Signpost (Electronic News) Service for Europe

An overview of the UK service is described in 2.1.2

Specific services are:

A set of functions for users of the News Service. These include the following:

- News Search: allows a user to identify sites and web pages which contain particular keywords, or in the advanced search to restrict the results to those from particular sources (e.g., EEVL) or individual countries
- Creating User Profiles: any known user can create a notification profile based upon their most recent search. The user specifies the frequency of notification of new or updated news in their field of interest in a user-named profile.
- Submit a Site: allows a user to promote a site they believe of relevance to the built environment industries. Promoted sites are hand checked prior to insertion and indexing in the system as a quality measure for the service

- Feedback mechanism: allows a user to provide feedback on the News Service concept and specific portions of the service.

One main function for web site owners in the News Service. This is the following:

- Submit a Site: allows a web site owner to promote their site. Promoted sites are hand checked prior to insertion and indexing in the system as a quality measure for the service.

For some countries targeted national web search facilities (selected by the project participants) have been implemented (Finland, Iceland, Italy – 4500 URLs, Netherlands, Spain) and these can either be searched individually from the national sites or by selecting a subset of them from the European Gateway.

Finland

A Finnish commercial service has been linked into CONNET by VTT and is fully interoperable. There are some 1000 sites in BuildNet.

Iceland

The Icelandic News Service Centre (NSC) was initially launched in month 6. The NSC conforms to the CONNET data model and API specification. It's functionality has been improved and refined.

The set of functions available to users in the News Service Centre include the following:

- Quick Search: users can search for web-sites based on a keyword from any web page in the centre. During this search – database fields and free text index are searched.
- Search Form: allows the user to specify search terms for a number of database fields simultaneously.
- Extended searches: allows the user of the NSC to a) extend searches to other centres registered in the CONNET IS gateway. b) extend searches to other NSC centres registered with the CONNET European gateway for searches across Europe.
- Submit a Site: allows a user to enter a new site of interest to the database. All site entered this way are manually checked for relevance before committed to the database for harvesting.
- Registration service: allows a user to register with the CONNET gateway as well as to maintain the information entered by the user at any time.
- User Profile Service: once registered, users can create and maintain user profiles of searches and can request notification on new and updated material when it becomes available.

Navigation of material in the centre will be further refined by adding a table of content (ToC) for users to browse content by category. The ToC will be based on the Finnish Talo 90 classification system.

The database is currently updated manually as information on new sites becomes available. A Web-spider tool has been adapted for automation of updates and for finding new and updated web-sites. The tool is given a set of URL's for harvesting. During harvesting the tool navigates links on web-sites three level deep and extracts information stored in Meta-Tags; Title, Keywords and Description as well as extracting all text with in a html page, inside the body tag for indexing. The tool discovers new web-sides by saving all URL's referenced that do not match the initial navigation path (i.e. don't share the same domain name or reference a different web-site within the same domain). The Web-spider recognizes the presence of the robot.txt file and the ROBOT tag in Html pages and acts accordingly.

Italy

A service has also been created for Italy and is currently hosted at BRE.

Netherlands

A substantial collection of Dutch websites has been used to create a service and this is currently hosted at BRE. The Dutch participant selected some 350 sites that had English interfaces so that they would be useful for foreign users.

Spain

A service has been created for Spain together with a Spanish version of the web pages corresponding to this service. This is currently hosted at BRE but will be moved to a CSIC server in the next few months.

Slovenia

An existing signposts service has been integrated into the CONNET services.

UK

The database of sites that provide news of various types for the construction industry now contains over 19,000 sites that are classified as to the type of information they contain, the type of organisation that provides the information (quality measure), as well as keywords about the site. This is the starting point from which to harvest news from all of the sites. The web-spider and indexing system is running on a machine at BRE.

Belgium

A service was set up for Belgium using a list of URLs provided by Ministère de l'Equipement et des Transports. This required an effort of approx. 1 day in total.

2.2.3 Calculation and Software service

An overview of this international service is given in 2.1.3

Slovenia hosts this service for all countries and most partners feel that only an English language service is required.

A new web interface for rating software available through the Calculation and Software Centre has been developed by IKPIR. The rating system will be integrated into the existing system. This rating system will allow users to rate software according to its stability, features, ease-of-use and value. The basic rating provides just information on whether the user would recommend the software product or not. According to user preferences, a user can publish their name and contact information to allow a more detailed assessment to be provided or to offer assistance with certain software. This system extends the business model of the existing service by adding value through the community of users.

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.

The service was implemented using the WODA database platform, together with end user and information provider interfaces, password protection and security.

A set of functions is available for users of the Calculation and Software Centre. These include the following:

- Navigation: a variety of hierarchical navigation routes to identify relevant software. This can be by professional domain, vendor location, software platform, or the EI (Engineering Index) classification
- Search: a general search mechanism allows the identification of any software matching user-specified keywords
- Software Vendor Catalogues: the user can navigate from an individual software item to all offerings from a vendor, or through the location interface to the vendor offerings for a particular nation
- User Profiles: allows known users to store identified software in an area analogous to a shopping basket. In future versions of the system this may allow purchase of identified software

A set of functions is available for software vendors in the Calculation and Software Centre. These include the following:

- Managing Software Items: allows a vendor to securely manage the information held about their organisation and the software they offer to the industry
- Advertising Interface: allows on-site advertising to be booked for the service. Currently this works on a reciprocal system where in exchange for allowing a particular vendor to advertise on the site the vendor includes the Calculation and Software Centre advertisements on their site.

A breakdown of the software contained in the database is shown below.

Software category	# of listings	subclassification
Architecture	237	3 subcategories
Construction	21	
Engineering	3054	59 subcategories
General	1570	47 subcategories
Management	143	5 subcategories

Software listings in CSC by categories

The 1200-plus publishers of software for the built environment are drawn from a wide range of countries. The top ten are shown below (in descending order of number of identified publishers):

1. USA (587)
2. United kingdom (126)
3. Canada (86)
4. Australia (82)
5. Germany (32)
6. France (24)
7. Italy (19)
8. South Africa (18)
9. Japan (16)
10. The Netherlands (14)

This shows a clear need for greater identification and promotion of European A/E/C software for the European industry.

The usage statistics show that there is a significant number of repeat visits.

# of visitors	at least times	to	not more than times
3170	2	-	10
5790	10	-	20
1074	20	-	30
320	30	-	50
181	50	-	100
94	100	-	200
28	200	-	300
8	300	-	and more

Visitors grouped by number of visits

2.2.4 Waste Exchange (Materials Interchange) Services

Finland

It is expected that the Finnish Waste Exchange Centre http://www.rakennusluuppi.fi, an existing commercial system, will be moved to the BII server and run by them from the beginning of 2001 as a commercial service. Rakennusluuppi is a web-based data base service for re-use of building components and materials, mostly from demolished buildings. Suppliers can advertise for free.

There is also another service in Finland - 'Rakennusapteekki' http://www.rakennusaptekki.fi. This is an emerging service and is not yet linked to from the Finnish pages. It is similar to http://www.rakennusluuppi.fi, but so far the only thing they have on the web is a possibility to print an order form and sent it over the net or by fax. On the web pages of today are mainly products for traditional buildings for sale. They have a large amount of spare windows, doors, equipment and fittings, but these are not on the web yet.

Iceland

The Icelandic Waste Exchange Centre (WEC) was initially launched in September 2000. The WEC conforms to the CONNET data model and API specification. It's functionality has been improved and refined. The WEC offers customers to trade waste material, second hand or unused surplus construction material for utilisation or recycling purposes. Material registered in the centre is classed by category on material type and regional location.

The set of functions available to users in the Waste Exchange Centre include the following:

- Quick Search: users can search for waste materials based on a keyword from any web page in the centre. Based on the search results the user can request full details on the item selected, contact information, availability, price etc.
- Search Form: allows the user to specify search terms for a number of database fields simultaneously for detailed searches.
- Extended searches: allows the user of the WEC to a) extend searches to other centres registered in the CONNET IS gateway. b) extend searches to other WEC centres registered with the CONNET European gateway for searches across Europe.
- Registration service: allows a user to register with the CONNET gateway as well as to maintain the information entered by the user at any time.
- User Profile Service: once registered, users can create and maintain user profiles of searches and can request notification on new and updated material when it becomes available.

- Waste Material entry form: allows parties selling or disposing of stock, second hand, demolition or waste material to post an advertisement to sell or trade. Information is supplied in detail of contact information, condition, category, location, price and time. Users can also advertise for material needed and list upcoming demolitions using this form.

The site will also list waste material available at selected official disposal sites in Iceland. This part of the service serves data collection and statistical purposes only. An exchange service will be created in the near future, as an extension to the centre, for the public that corresponds to newspaper small advertisements. The service will charge the party placing the advertisement when a transaction is made.

Italy

Discussions with Italian Chambers of Commerce in Milan and Lecco will be continued. They will be responsible for waste management under a new law.

Netherlands

There are three independent online exchanges in the Netherlands with a mixture of membership fees and pay-per-use models (http://www.ngbb.nl, http://www.reststoffenbeurs.nl, http://www.andernet/bouwbank). A number of private demolition companies in Netherlands offer material on their sites. They are still experiencing some problems, including the identification of suitable material through the lack of a suitable terminology. The CONNET data model and thesaurus could provide improvements for the future and IntraBouw will consider such a development.

Slovenia

An exhibition for producers and users of waste material was organised in Slovenia and an initial database of relevant companies has been created. IKPIR has developed a web application for waste exchange in Slovenia. The facility is based on the BRE waste exchange Data Model specifications, but was developed independently. IKPIR will offer this developed application to any interested party in Slovenia for use and further development.

Spain

Some negotiations are underway and it may be that a Spanish service will be created, but this will not be within the lifetime of I-SEEC.

UK

The UK has a system available through CONNET and is currently in discussion with a commercial on-line provider with a view to creating a commercial service.

The Waste Exchange Centre provides a trading post for second hand and unutilised construction materials over the Internet. The Waste Exchange Centre is established in a national context (as required by EC restrictions on transport of waste across national borders), though it can also be tailored for an individual organisation's internal trading

with links through to the national system. The Waste Exchange Centre allows the identification of sources of materials based on their type, the location available, and the period available. Contact details enable sellers and potential buyers to come together. Construction firms looking for a particular type of material can also advertise their requirements through the exchange. The Centre can be tailored for various regions in a country and for differing types of waste through the adaptation of location and waste-type tables inside the system. The major categories of waste and excess material that are handled by the exchange are:

- Recycled materials and demolition products
- Over-ordered and unused stock
- Materials wanted
- Upcoming demolitions

A set of functions is available for materials seekers in the Waste Exchange Centre. These include the following:

- Searching: a categorised search against the various material categories, locations and availability period. Matching items are returned to a user who can request full details for purchase or exchange.
- Creating User Profiles: any user can post a request to the wanted board that will enable an active notification for materials that are entered in the other parts of the exchange.
- Links and References: guides the user to other valuable sources of information (and other exchanges in the area) as well as reference publications and reports on waste management.
- Design for Dismantling: provides a best practice guide to the industry on considerations for the design of a building for the dismantling and demolition stages
- Feedback mechanism: allows a user to provide feedback on the Waste Exchange Centre concept and specific portions of the service.

A set of functions is available for sellers of waste materials in the Waste Exchange Centre. These include the following:

- Advertising Waste Materials: allows an item to be posted with details of category of waste, location and availability period
- Creating User Profiles: any seller can request automated notification of matches with users requesting similar materials through the system

- Feedback mechanism: allows a user to provide feedback on the Waste Exchange Centre concept and specific portions of the service.

2.2.5 Manufactured Products Service

Finland

The system developed under CONNET has been integrated into the CONNET services. It has 18,000 products, 2,500 firms and 400 product sheets. The information provider pays for the product sheets. There are different levels of access whereby users can see more/less information. I-SEEC has enabled the CONNET prototype to be developed into a commercial system. It was launched in January 2001.

Entries are classified according to the Finnish product classification "Construction 90", and are searchable by the name of the product or the manufacturer, and also by the properties of the product (i.e., find doors that are 1000 mm wide). The service was developed by BII with the help of VTT, and uses CONNET core services developed by BRE. BII was responsible for the overall planning and implementation of the service, BRE provided the CONNET core services (user profiling etc.) and VTT helped in implementing the connections between the Manufactured Product Service and the core services.

The service works as follows: the Construction 90 (or Talo 90) classification tree allows users to navigate to the product group they are interested in. Clicking on the appropriate group, will produce a search frame listing all products in that group, and presenting the user with a choice to search the products by any property or combination of properties that have been used in the group.

As a result, the user will get a list of all the products in that group, which meet the search criteria. Clicking on the name of the product will open up links to further information, e.g. the corresponding RT-net product sheet (see Figure below). The product sheet can present quite a lot of detailed information about the product, and there is more information in the attached PDF version of the original RT-document. Other files may also be attached, such as picture files, text documents or CAD drawings.

A set of functions is available for users of the Manufactured Product Service. These include the following:

- Searching: provides the user with a primary search mechanism utilising the Construction 90 classification system allied with product and manufacturer names. The secondary search mechanism then offers product parameters to narrow the selection to those exactly matching performance requirements.
- Attached Documents: all selected products have a range of attached documents that can be retrieved through the web browser. Some, including CAD detail files can be dragged and dropped into user side applications.
- Feedback mechanism: allows a user to provide feedback on the Manufactured Product Service concept and specific portions of the service.

One further function is available for manufacturers allied with the Manufactured Product Service:

- Product Data Extraction: provides manufacturers with a sophisticated database tool allowing them to describe their products, along with any performance attributes they wish to ascribe, in a simple format which can be utilised by the Manufactured Product Service.

Slovenia

A manufactured product service was added to the CONNET Slovenia national node according to ongoing co-operation with one of the most important Civil Engineering magazines for the general public - GRADBENIK, who also operates a construction Web portal Hradbenik.net. It provides information on available manufactured products through classification code browsing and through a text search facility. Full interoperability with CONNET services has not been implemented but will be discussed with Gradbenik.

A proposal to undertake further R&D and exploitation of such a service has been submitted to the EU under the IST call (Products.forAEC). Partners include some I-SEEC partners – BII, BRE, IBRI, IKPIR, VTT as well as additional organisations. This will complement work undertaken by the EU project eConstruct.

United Kingdom

BRE has developed a prototype MPS system prior to CONNET. Funding has been secured to develop certain aspects of this. This entails a) working with the IAI on the development of External Libraries for the description of product attributes in a standard format and b) developing actual tools based on IAI definitions and IFCs together with industrial partners. BRE is also a partner in the products.forAEC proposal submitted to the EU.

2.2.6 Who's Who service

Finland

BII has produced a Who's Who database. The commercial implementation of the database is a CD that is part of the Builders' Calendar - a book that has been published annually since early 1900. The CD is the first CD ever and replaces the previous paper version. It contains a database of members of all branch organisations and other organisations that are of importance to the building industry in Finland. These include all ministries and government offices, municipal offices, schools and universities. It is a very comprehensive collection that includes practically everything except commercial firms. The CD includes individuals: all Masters of Architecture, Masters of Civil Engineering, as well as Bachelors of Architecture and Bachelors of Civil Engineering and the formal professional competencies of all of these. Information about 20,000 people (almost everyone in Finland) are stored and made searchable in the database. It has been published only on CD. This is not yet on the Internet for two reasons:

1. As the database is a part of a commercial product, it can not be published free of charge on the Internet. A valid business model must first be developed, with solutions for user identification and/or electronic payment. BII is developing such solutions within other projects and hopes to use the same techniques with this product.

2. BII does not have permission from the people in the database to publish their information anywhere other than this CD/print publication. The Finnish legislation states that data can not be published without each individual's permission. BII will ask for their general permission as a part of gathering updated information for next year's calendar. Permission from each organisation for the use of their data must also be obtained.

Once these two problems are solved, the database is "internet-ready", and would need very little modification.

The BII CD-database does not conform strictly to the I-SEEC API, mostly because it is a pilot for a commercial product, based on the database used in production of the printed Who's Who. It is intended to rebuild this using the I-SEEC API as the basis. An online version is expected in about 1 year.

Before starting that work BII will gather user feedback on the published database.

The current plan is that:

- information on organisations is free
- a database of individual experts can be made available on CD-ROM to those who have bought the book
- these services will be advertised through I-SEEC

Iceland

The Icelandic Who's Who Centre (WWC) was initially launched in September 2000. The WWC conforms to the CONNET data model and API specification. It's functionality has been improved and refined. The database maintains information on Industry professionals, organisations and associations. Information is interlinked such that professionals can be listed as members or employees of associations or organisations and vice versa.

The set of functions available to users in the Who's Who Centre include the following:

- Quick Search: users can search for items based on a keyword from any web page in the centre.
- Search Form: allows the user to specify search terms for a number of database fields simultaneously for a refined search.
- Extended searches: allows the user of the WWC to a) extend searches to other centres registered in the CONNET IS gateway. b) extend searches to other

WWC centres registered with the CONNET European gateway for searches across Europe.

- Navigate by table of content: provides an alphabetical listing by categories - Professionals, Organisations and Associations.
- Browse by classifications: allows a user to browse the content of the WWC database by profession or type of organisation. The classifications systems used are based on the systems used for economic reporting in EU member states.
- Register and request to join form. Allows a user to submit a request to join. Upon receipt of payment the user is issued a user account and a password. From the User Account Service the user can enter and maintain information in the WWC database.
- Registration service: allows a user to register with the CONNET gateway as well as to maintain the information entered by the user at any time.
- User Account Service: once registered, users can view the status on their business account and maintain billing information. Update and maintain entered information such as a company / professional contact information, competences, skills, project information, document links for downloadable documents, banner-adds etc.
- User Profile Service: once registered, users can create and maintain user profiles of searches and can request notification on new and updated material when it becomes available.

IBRI and IBIC have initiated discussions with the following associations for permission to enter their complete membership lists:

- The Federation of Icelandic Industries: Contractors, trade associations and manufacturers.
- Icelandic Association of Architects,
- Icelandic Association of Civil Engineers,
- Icelandic Association of Consulting Engineers,
- Society of Architects in Private Practice.

Some of these associations have already given permission for inclusion of their member lists while others are still considering. There are good prospects for the inclusion of up to 90% of industry contacts by inclusion of these member lists. Further government contacts and suppliers of construction products will be entered manually.

There are however some legal issues that need to be resolved before data can be transferred in earnest. The site may need a formal license for operation if personal data is to be included. Currently only name, address and phone number will be included

automatically, all other information will have to be offered voluntarily by users. Secondly during our discussions the question has been raised whether e-mail addresses of individuals will be included. There is a great resistance to this by many people involved.

Individual databases will be prepared for each association and a transfer tool to update and translate these databases to the WWC database.

A tool is being developed to transfer the IBIC directory, which includes a list of practising architects, contractors and a service directory for the construction industry to the WWC database.

The WWC allows hosting of additional textual information, attachment of documents, hosting of homepages etc. that will be charged for by the service. A space is allocated on the site pages for advertisements.

Italy

An Italian system has been created by BRE using data supplied about some 650 Italian organisations. The service is restricted to organisations, rather than individuals, and will be a free service.

Netherlands

A database of about 350 internationally relevant Dutch organisations has been organised into the framework of the Construction Industry Directory developed by the BRE and made available for I-SEEC. The database has been enhanced with English language descriptors. Mail addresses and websites have been added where available. For the longer term discussions will be conducted with BouwOnline who already operate a Yellow Pages service.

Slovenia

A Who's Who service was developed together with the Engineering Chamber of Slovenia. Interfaces are provided in Slovenian and English. The Engineering Chamber has a database of all certified engineers and construction-related companies in Slovenia. The Slovenian interface is part of the Engineering Chamber's home page. An English interface allows use from abroad - accessing the CONNET gateway to find engineers and companies in Slovenia by profession, city or personal information. The database contains about 5,000 certified engineers and provides reliable information to anyone that is interested in construction-related works in Slovenia so that he/she can check whether a company or individual can perform design or construction-related task according to Slovenian law. This service is free but the business Iceland model will be considered.

Spain

The Spanish system was created by BRE using data supplied by IETcc CSIC. The new version has been enhanced with English language descriptors and the web pages corresponding to the Who's Who service have been translated into Spanish. Due to legal reasons the database only includes organisations i.e. not individual members. For example, the Professional Body of Engineers has some useful information about each

member but this is restricted to use by members. In order to include such information on the CONNET database it would be necessary to obtain the agreement of every individual member. This is not possible within the life of I-SEEC. The system is being made available as a free service.

UK

The UK has integrated a Directory of UK organisations into the I-SEEC services and this has proved useful. It is a free service to add value for users of the other systems.

2.2.7 Specialist Equipment and Facilities

Iceland

A service has been developed that is based on the same data model and a scaled down API as the BRE Specialist Equipment and Facilities Centre, but with some extensions to both data model and classification structures. Currently no information is available from suppliers and the centre has not yet been launched.

Italy

ICITE has developed a service that is currently hosted at BRE. All ICITE services/specialist equipment are included. This will be a free service.

Slovenia

A wrapper has been created to incorporate the Gradbenik.net database into CONNET Slovenia.

Spain

IETcc has developed a service that is hosted at BRE. Some IETcc services and specialist equipment are included. This will be a free service.

UK

A system has been set up for the UK that allows searches to be made for specialist equipment and facilities available from BRE. It is planned to extend the coverage of data to include all test facilities. Classification-based searching was developed but will not be included in the I-SEEC system. This is viewed as a free service to help advertise specialist facilities for a fairly small market. It is not intended to be a fee-charging service. If the service were to be extended to other suppliers this may be implemented.

2.2.8 Best Practice service

Finland

The Finnish site deals with Construction IT and has been integrated into the CONNET services. It was initiated under the EU SCENIC project, and reworked in I-SEEC to be CONNET compliant. Some 12 best practice procedures have been implemented in the

service to date. The VERA Programme and its numerous projects (>120) will be considered as a source for further information in the future.

Iceland

An initiative is underway to establish links with other organisations for an establishment of a BP consortium. Several meetings have been held with "Ibudalanasjod", an organisation that handles all public housing in Iceland. They have all documents regarding construction of public housing in Iceland over the past 40 years - design documents, costs, maintenance etc. IBRI is working to establish a 3-year project to extract best practice information from these documents and a 6 year project on building maintenance by IBRI. These will form a basis for a best practice site for construction in Iceland and maintenance of housing. Funds are currently being sought for further development of this initiative.

Italy

ICITE has organised two discussion fora concerning the following topics that may have relevance to a future best practice initiative:

- Performance-based approach in the construction sector: technical standards and regulations
- Sustainability assessment in construction

By starting these two fora ICITE has initiated a discussion at the Italian level about the main R&D issues promoted by the CIB (International Council for Research and Innovation in Building and Construction) within the framework of the international scientific community. The fora address all the players of the building process who need to actually apply the performance-based approach and the assessment of sustainability in construction as well as the world of research which directly contributes to the development of such issues (http://www.qec.it/forumicite).

Netherlands

A service to enable lessons to be learned from mistakes is being considered. A database is currently freely available but not yet implemented. The publisher is not yet ready for net publishing. Such a service is operating in Germany (IRB).

Slovenia

GCS intends to develop an Internet site of its own, representing a Slovenian GCS CONNET Gateway. GCS feel that this is appropriate due to their long established and recognized role in the Building and Construction industry in Slovenia. Their experiences and achievements in co-operating with the industry and government institutions are invaluable. The GCS CONNET gateway is based on providing their own developments and professional results in the Building domain.

This site has not yet been set up due to problems in securing finances for the HW and SW infrastructure.

One of the main services that GCS will develop is a Best Practice service based on the Slovenian national project Quality Mark in Construction (QMC). This is described here. A Quality mark is awarded for the best achievements in the construction industry in Slovenia. The mission is:

- 'to promote striving for excellency and quality and to increase competitiveness of products and services in the area of construction industry in Slovenia.'

A Q.M.C mark is an optional certificate mark and trademark. It is meant for products and services that meet high, professionally prepared and internationally comparable specifications of quality. Additionally, suppliers of products and services should implement quality system and work towards business excellence. It is awarded to products and services that score a certain number of points in the process of assessment. Conditions for the award are determined in the public invitation. The Q.M.C. Awardees has the right to use the Q.M.C. trademark for the awarded products and services.
The aims of the Q.M.C. project are:

- to establish Q.M.C. as a permanent project of assessment of products and services in construction area on the basis of internationally comparable criteria and methodology
- to establish Q.M.C as an instrument of consumer information and protection
- to improve quality of products and services and therewith the competitiveness of Slovenian construction industry
- to encourage the research and development of new products
- to promote Slovenian products and services at home and abroad
- to win recognition of Q.M.C. in Europe.

As a result of this project there is an emerging database of best quality products and services in Slovenia and of best practices that will form the basis for the CONNET best practice service.

Spain

IETcc is exploring ways to bring information from Spanish national projects together to create a BP service. This is currently being developed.

UK

The UK has a substantial programme to develop Best Practice information for the construction industry and BRE and the Construction Best Practice Programme Unit have created very extensive web-based facilities. These services have been implemented in the CONNET infrastructure so that searches can now be made throughout the best practice site (www.cbpp.org.uk). Additional sites dealing with more specialist topics are under development (Construction IT, Building Services, Housing). It is likely to remain

as a Government funded service for several years to come but at some point the need to cover costs may lead to a pay-per-use outcome.

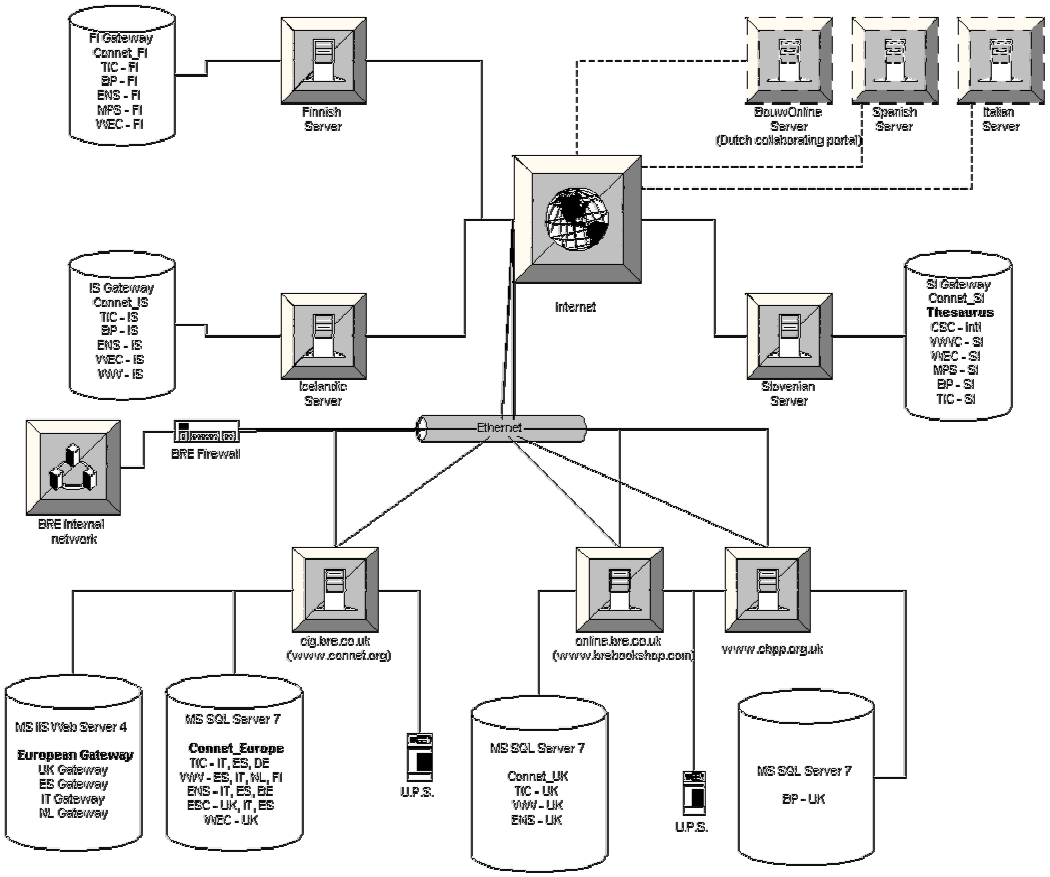
2.3 Systems view of services, data location, servers

This section is intended to give enough technical detail to allow an IT-knowledgeable reader to understand the basic systems and concepts and to form a preliminary assessment of what would have to be done to link in their own system or to create a new one.

Security and operational issues have not been covered in detail but it should be appreciated that the whole system is as good as its weakest link. Efforts have been made to ensure that undue reliance for a given service has not been placed on the 100% operation of all other systems. If for example the thesaurus server is unavailable due to server malfunction a search should still proceed without use of synonyms without affecting the user. Further information is given in Annex B on existing hardware and software components and a typical set up required for a new service/gateway.

2.3.1 Overview of systems

The diagram below shows the locations of the various servers and databases used by the CONNET system - the section that follows gives details of the web sites and services hosted on these servers.



The thesaurus, Connet_Europe database and the European gateway can all be used by other services to enhance their searches, and are marked in bold.

Virtual host: www.connet.org (host: cig.bre.co.uk)

Hardware:

- Dell PowerEdge 2400 server
- 35Gb hard disk (RAID level=?)
- 512Mb RAM
- DAT backup drive
- UPS (Approx 30 mins)

Software:

- MS Windows NT Server v4 sp5

- MS IIS web server
- Jrun v3
- MS SQL Server 7

CONNET services hosted:

European gateway

- Web pages
- Database of services
- API to allow queries to be passed between services

UK national gateway

- Web pages
- Specialist Equipment service

Italian national gateway

- Web pages
- Signposts
- Technical publications
- Who's who
- Specialist equipment

Spanish national gateway

- Web pages
- Who's who
- Signposts
- Technical publications
- Dutch national gateway
- Web pages
- Who's who

Slovenian national gateway

- everything is redirected to connet.fgg.uni-lj.si

Finnish national gateway

- Who's who
- For everything else we redirect to http://cic.vtt.fi/connet/

Icelandic national gateway

- All redirected to http://www.rabygg.is/connet/

Belgian national gateway

- Web pages
- Signposts

German national gateway

- Web pages
- Technical publications

Virtual host: www.brebookshop.com (host: online.bre.co.uk)

Hardware:

- Dell PowerEdge 1300 server
- 25Gb hard disk (RAID level=?)
- 512Mb RAM
- DAT backup drive
- UPS (Approx 30 mins)

Software:

- MS Windows NT Server v4 sp5
- MS IIS web server
- Jrun v3
- MS SQL Server 7

CONNET services hosted:

- UK national gateway
- Technical publications

Host: online.bre.co.uk

Hardware:

- Dell PowerEdge 1300 server
- 25Gb hard disk (RAID level=?)
- 512Mb RAM
- DAT backup drive
- UPS (Approx 30 mins)

Software:

- MS Windows NT Server v4 sp5
- MS IIS web server
- Jrun v3
- MS SQL Server 7

CONNET services hosted:

- UK national gateway
- Signposts
- Who's who
- User profiles

Host: www.cbpp.org.uk

Hardware:

- Dell PowerEdge 2300 server
- 25Gb hard disk (RAID level=?)
- 256Mb RAM
- UPS (Approx 30 mins)

Software:

- MS Windows NT Server v4 sp5
- MS IIS web server
- Jrun v3
- MS SQL Server 7

CONNET services hosted:

- UK Best practice service

All services have been developed using a combination of HTML and Java technologies (servlets and JSP).

The VTT services are as follows:

Host: cic.vtt.fi

- Nat. gateway

- Signposts service

- Construction IT Best practice

- Publications service (the bookshop are separate)

Host: otatrip.hut.fi

- VTT publications

Host: www.rakennustieto.fi

- BII Bookshop

- MPS (linked, not integrated)

Host: www.rakennusluuppi.fi

- WEC (linked, not integrated)

2.3.2 Description of functionality of European Gateway

The European gateway is the core point from which construction resources and resource providers can be identified throughout Europe. It allows users to identify the quality resources of many types available within nations and across nations. It helps users access the European industry's knowledge base for their profession in order to provide solutions to problems at any stage of a construction project. It enables them to identify resources from many sources in many markets from a single point, and then navigate to the right provider to gain the identified resource. The range of services it offers to individual users, national gateways, and participating services include:

- Identification of available resources drawn from all of the service providers across Europe participating within the CONNET initiative. This allows a query to be passed to all (or a specified number of) services and the results from all services to be collated and presented back to the user.

- Identification of quality resource providers and services within a nation, and in Europe, for differing information requirements. This allows navigation and identification of individual services either at a national level (what is available in

each country) or by service type (e.g., which countries have technical information services).

- Management of a user identification system. This uniquely identifies a user who has previously interacted with any CONNET service or system within one country. Each service can request this identification the first time they serve a page to a user of their service.

- Provision and maintenance of user profiles. There is a centralised database of users of CONNET services (whether registered or not). This allows any service to uniquely identify a return user and to record their usage patterns inside their service. The profiling service also allows users to record their interest in receiving information from a service (e.g., newsletters, periodic news on their areas of interest, etc). As all of a user's profiles are maintained centrally, at a national level[2], over all services the user can manage all their profiles from a single point. This includes running a profile immediately, and deleting a named profile for any of the CONNET-linked services with which the user has registered their requirements. The system is structured in four parts:

- Core information on the known user: this is personal information on name, organisation, country, occupation, how long with CONNET, profession, etc.

- User-specified interest profile for a particular service: the user's list of terms/keywords for which they wish to have notification from a service, along with notification frequency.

- User tracking: what the user searches for, what they open or load, what they subscribe to as a data warehouse repository.

- Provision of classification code support. This is provided through a generic database of classifications (currently Building 90 and UNICLASS). This service allows navigation through a classification code hierarchy and global search for codes across a whole classification system (e.g., based on keywords). There is also a very simple code translation system between any two codes based on keywords in a code's title.

- Provision of a thesaurus tool to allow systems to find related words for a set of user-specified ones; there are approx. 19000 terms in total, with content in up to 11 languages including Danish, Dutch, English, Finnish, French, German, Italian, Portuguese, Spanish, Swedish and Greek, and five classification systems (Talo 90, CPV, EPIC, NI SfB)

- Provision of language translation services through outsourced systems (i.e., Babelfish from AltaVista)

- Provision of standard code tables for services to incorporate. This includes the ISO tables for countries, languages, and currencies. All services are encouraged to

[2] This facility has not been implemented by all countries

upload their national or specialist tables in order that other services can look for similarities or re-use their systems.

- Management of inter-service communication. CONNET maintains directories of all services which are linked in. This allows all comparable services to be identified and for a message to be passed from one service to another one to answer (for equivalent services in other countries or other domains).
- Provision of across-service communication. CONNET provides services with the means to identify and send queries to other types of services which provide related information types (e.g., from technical information to software).
- Monitoring of nodes. There is an automated request mechanism for the European Gateway and the services hosted by it. Unanswered requests are notified to the CONNET helpdesk to rectify.

A national gateway is the core point through which users can identify the available quality information services and resource providers in a country. It helps users access the national industry knowledge base for their profession in order to provide solutions to problems at any stage of a construction project. It enables them to identify resources from many sources in many markets from a single point, and then navigate to the right provider to gain the identified resource.

A national gateway is in almost all respects a scaled down version of a European gateway. It provides the same types of services (see list above) and similar search and navigation features to the European gateway. Its main distinguishing factors are that: it communicates in the national language; and that in the first instance it identifies resources only from that particular country (though a national search can be widened to include all of Europe). Therefore a national gateway better serves its national user base by providing local and familiar context, but still retains the power of accessing the European knowledge base for construction.

2.3.3 The minimum levels of functionality for a National gateway

This section describes the minimum level of functionality required from a National gateway i.e it should be able to provide details of the services that it offers. To do this each National gateway must provide the European gateway with an URL that can respond to the following queries:

- List services
- Get service details

e.g. the URL for the European gateway is
http://cig.bre.co.uk:80/servlet/connet.core.server.Server

There is a more detailed document DM/API (Amor et al, May 2000) that describes a fuller set of functions than were originally envisaged.

List services

The list services function is called by adding the query string "Format=text&Submit=ListServices" to the URL to the API server. The results should be a comma separated list of service ID numbers terminated with the word END e.g. `1,2,3,4,END`

Or if there are no services then the result should be the word `null`.

Get service details

This function takes one parameter which is the service id (found using the list services function) and returns the full details of the service.

The get service details function is called by adding the query string

```
"Format=text&Submit=GetServiceDetails&ServiceID=" +
serviceID
```

to the URL to the API server. The results can be generated by creating a new Service object and calling its' `toEncodedString` method.

The following example shows the API call to the UK server requesting the details of the UK TIC service, it also shows the format for the result the API returns

```
http://online.bre.co.uk/servlet/connet.core.uk.Server?Format=text
&Submit=GetServiceDetails&ServiceID=3
```

this will return details on out bookshop in the following format

```
serviceID=3
systemID=1
serviceName=BREbookshop.com
URL=http%3A%2F%2Fwww.brebookshop.com%2F
country=GBR
serviceType=2
parent=0
serviceLevel=Ntl
helpDeskURL=http%3A%2F%2Fwww.brebookshop.com%2Fhelpdesk.jsp
elecEntryURL=http%3A%2F%2Fwww.brebookshop.com%2Fservlet%2Fconnet.tic.uk.Server
certificate=
associationStatus=1
chargingStrategy=1
organisationName=BRE
address=Bucknalls+Lane%2C+Garston%2C+Watford
telephone=%2B44-1923-664556
fax=%2B44-1923-664689
webPage=http%3A%2F%2Fwww.bre.co.uk%2F
email=hutchisona%40bre.co.uk
contactName=Alastair+Hutchison
postCode=WD2+7JR
organisationType=Research
newService=false
```

The format for this result is:

```
field1=URL-encoded value
field2=URL-encoded value  etc
```

The separator between fields is a new line.

2.3.4 The minimum level of functionality for a service

The minimum level of functionality required from a service is that it must be able to accept a query from another service or a gateway (national or European). To do this each service must provide to its' national gateway (and to the European gateway) with an URL that can respond to the following queries:

- Submit query

e.g. the URL for the UK bookshop is

http://www.brebookshop.com/servlet/connet.tic.uk.Server

Submit query

The European gateway searches services by taking the URL to the services API found in the ElecEntryURL and adds the following query string:

```
      "Format=text&Submit=search&Query=" +
URLEncoder.encode(query);
```

where **`query`** is a variable containing the keyword(s) to search for. So each service must supply an URL that will accept this type of query and send back results as described below.

In describing how results should be returned we will assume that the Java wrapper around the API will be used but it is not necessary to use the Java wrapper as long as the text format used is the same as that generated by the Java classes. The method described will be the method that BRE uses to implement the APIs for the services it hosts.

After receiving the query the service should do a search storing each result in a `searchResult` object. The `searchResult`s (upto a maximum of 10) are stored in a vector. The output is then generated with the following code:

In the code `results` is the vector containing the `searchResult` objects.

```
// package any results up to send via the api
StringBuffer output = new StringBuffer();

// first we send the number of results
output.append( results.size() );
output.append("\n");

// now send the URLEncoded results
for( int i = 0; i < results.size(); i++ ) {
       // we will append the URLEncoded result - this means that each result will
be
       // on a separate line on the output which will be easier to decode at the
       // other end.
       output.append( URLEncoder.encode(
((searchResult)results.elementAt(i)).toEncodedString() ) );
       output.append("\n");
}

return output.toString();
```

The following example shows a query being sent to the UK TIC service.

The API call to search the bookshop with the query "hvac problems" is

http://www.brebookshop.com/servlet/connet.tic.uk.Server?Submit=search&Format=text&Query=hvac+problems

the result is:

```
6
title%3DHVAC%2BTroubleshooting%2B-
%2Bguide%2Bto%2Bsolving%2Bindoor%2Benvironmental%2Band%2Benergy%2Bconsumption%2
Bproblems%0Atext%3DFletcher%2BJ.%2B%25281999%2529%0Aurl%3D%252Fservlet%252FTIC_
details%253Fid%253D30836%0Alogo%3D%252Fconnet%252Fimages%252Fbsria.gif%0AlogoUR
L%3Dhttp%253A%252F%252Fwww.bsria.co.uk%252F%0Aprice%3D%2526pound%253B55.00%0Ase
rviceName%3D%0A
title%3DHVAC%2Btroubleshooting%2Bmanual%0Atext%3DFletcher%2BJ%2B%25281999%2529%
0Aurl%3D%252Fservlet%252FTIC_details%253Fid%253D30838%0Alogo%3D%252Fconnet%252F
images%252Fbsria.gif%0AlogoURL%3Dhttp%253A%252F%252Fwww.bsria.co.uk%252F%0Apric
e%3D%2526pound%253B45.00%0AserviceName%3D%0A
title%3DResidential%2BConstruction%2BProblem%2BSolver%0Atext%3DJahn%2B%25281998
%2529%0Aurl%3D%252Fservlet%252FTIC_details%253Fid%253D38753%0Alogo%3D%252Fconne
t%252Fimages%252Fmcgraw.gif%0AlogoURL%3Dhttp%253A%252F%252Fwww.mcgraw-
hill.com%252F%0Aprice%3D%0AserviceName%3D%0A
title%3DEveryday%2BMath%2Bfor%2Bthe%2BBuilding%2BTrades%0Atext%3DGerhart%2B%252
81996%2529%0Aurl%3D%252Fservlet%252FTIC_details%253Fid%253D38728%0Alogo%3D%252F
connet%252Fimages%252Fmcgraw.gif%0AlogoURL%3Dhttp%253A%252F%252Fwww.mcgraw-
hill.com%252F%0Aprice%3D%0AserviceName%3D%0A
title%3DHVAC%2BPrinciples%2Band%2BApplications%2BManual%0Atext%3DMull%2B%252819
97%2529%0Aurl%3D%252Fservlet%252FTIC_details%253Fid%253D38805%0Alogo%3D%252Fcon
net%252Fimages%252Fmcgraw.gif%0AlogoURL%3Dhttp%253A%252F%252Fwww.mcgraw-
hill.com%252F%0Aprice%3D%0AserviceName%3D%0A
title%3DMastering%2BMath%2Bfor%2Bthe%2BBuilding%2BTrades%0Atext%3DGerhart%2B%25
282000%2529%0Aurl%3D%252Fservlet%252FTIC_details%253Fid%253D38997%0Alogo%3D%252
Fconnet%252Fimages%252Fmcgraw.gif%0AlogoURL%3Dhttp%253A%252F%252Fwww.mcgraw-
hill.com%252F%0Aprice%3D%0AserviceName%3D%0A
```

The first line contains the number of results being sent and each subsequent line contains one result. The result is url-encoded so that is sent as one line of text

The un-encoded version has the format:

```
title=URL-Encoded text - the main part of the search result e.g. the title of a
publication text=URL-Encoded text - any other text associated with the result
url=URL-Encoded text - a url to more details on the result
logo=URL-Encoded text - url to an image to be displayed with the result
logoURL=URL-Encoded text - link associated with the image
price=URL-Encoded text - any price information for the result (include currency
information)
serviceName=URL-Encoded text - the name of the service that provided the result
```

Again the format for this result is:

```
field1=URL-encoded value
field2=URL-encoded value
etc
```

The separator between fields is a new line.

While all of the examples given are for the TIC service, the API call for a query and the format of the result should be the same for all service types.

2.3.5 Passing queries between services

There are two ways a service can widen its search:

1. It can redirect/provide a link to the searchAll.jsp page on the European gateway passing the query and parameters to say which services and languages to search. This will produce a page with the European gateway design i.e. the user will have left the national gateway or service they were in before. Note that the speed of this search is dependent on the slowest service being searched.

2. It can use the API to get details of the services it wants to query from the European gateway. These details will contain the URL to the API of the service. The service can then be queried through its API and the results displayed to the user in the format that the original service wants to use.

If any of the servers that a query is passed to is unavailable the request should timeout and the user will simply get no results from the service that failed - this will not lead to any delay or error message for the user.

2.4 Core services – virtual technology park

CONNET provides a range of services, the majority of which are invisible to users, which are equivalent to the infrastructure services one would expect in a physical technology park. The eight services linked into the CONNET gateway utilise the provided infrastructure to varying extents. The technical information centre, for example, has the highest use of the infrastructure with discussion fora being the only technology park service not linked to provide its information service. CONNET has been developed with the aim of providing core infrastructure services that could be used by any linked information service. The following section provides a description of the services that have been provided.

The CONNET gateway is a ‘virtual technology park’, and to this extent provides a range of technology park services as well as industry-specific services. The available technology park services are:

- Provision and maintenance of the required infrastructure. This manages the machinery and software provided for the CONNET services. It ensures that the software components are usable by all potential users of CONNET as well as those offering services through CONNET.

- Management of inter-service communication. CONNET maintains directories of all services that are linked in. This allows all comparable services to be identified and for a message to be passed from one service to another one to answer (for equivalent services in other countries or other domains).

- Provision of across-service communication. CONNET provides services with the means to identify and send queries to other types of services that provide related information types (e.g., from technical information to software).

- Management of security services. This includes installation and monitoring of security systems and ensuring that the correct level of security is available for users and service providers in CONNET. Security for services offers and utilises IP-based security between CONNET-compatible services (i.e., CONNET will only respond to a known machine's request for information). This could be extended to encompass certificate-based security for all services in the future.

- Provision of a help desk. The helpdesk is a point of contact for potential service providers wishing to become involved in CONNET, giving advice on what can be achieved, in what time-frame, and at what cost. For users, the helpdesk provides a point of contact for problem resolution.

- Provision of an information broker role. This enables transparent access to information in the CONNET services. Each service draws together a single information type (e.g., technical information) from many disparate sources and makes it available through one source. CONNET draws all the services together to provide transparent access to a wide range of information types.

- Implementation and integration of the software required for the use of the services supported on the node. CONNET ensures that users can manipulate information from the services through the provision of software components appropriate for the task.

- Promotion of services and contact to the user industries. CONNET provides an electronic news service to the construction industry through the use of push-technology to inform on the progress of the CONNET services.

- Management of a user identification system. This uniquely identifies a user who has previously interacted with any CONNET service or system within one country. Each service can request this identification the first time they serve a page to a user of their service.

- Provision and maintenance of user profiles. There is a centralised database of all users of any CONNET service (whether registered or not). This allows any service to uniquely identify a return user and to record their usage patterns inside their service. The profiling service also allows users to record their interest in receiving information from a service (e.g., newsletters, periodic news on their areas of interest, etc). As all of a user's profiles are maintained centrally, at a national level, over all services the user can manage all their profiles from a single point. This includes running a profile immediately, and deleting a named profile for any of the CONNET-linked services with which the user has registered their requirements. The system is structured in four parts:

- Core information on the known user: this is personal information on name, organisation, country, occupation, how long with CONNET, profession, etc.

- Service-specific information for the known user: this includes e.g., for Manufactured Product Service: product group interested in; project type; location; last update of profile.
- User-specified interest profile for a particular service: the user's list of terms/keywords for which they wish to have notification from a service, along with notification frequency.
- User tracking: what the user searches for, what they open or load, what they subscribe to.
- Provision of classification code support. This is provided through a generic database of classifications (currently Building 90 and UNICLASS). This service allows navigation through a classification code hierarchy and global search for codes across a whole classification system (e.g., based on keywords). There is also a very simple code translation system between any two codes based on keywords in a code's title.
- Provision of a thesaurus tool to allow systems to find related words for a set of user-specified ones; there are approx. 19000 terms in total, with content in up to 11 languages including Danish, Dutch, English, Finnish, French, German, Italian, Portuguese, Spanish, Swedish and Greek, and five classification systems (Talo 90, CPV, EPIC, NI SfB)
- Provision of language translation services through outsourced systems (e.g., Babelfish from AltaVista)
- Provision of standard code tables for services to incorporate. This includes the ISO tables for countries, languages, and currencies. All services are encouraged to upload their national or specialist tables in order that other services can look for similarities or re-use their systems.
- Management of discussion fora through a database-driven system. This allows new topics to be created and for either facilitated or open discussions to be held on the topic. Discussions are managed in a hierarchical response format and can be rolled up into a summary document for archival purposes.
- Monitoring of nodes. CONNET collects simple up-time information through an automated request mechanism for each CONNET service. Unanswered requests are notified to the CONNET helpdesk to rectify.

2.5 Infrastructure Extensions

Functionality has been added to the infrastructure under the heading Multi-Classification and Multi-Language support. The initial approaches and experiences are introduced here with a new approach described in 2.5.1 and 2.5.2. Further information is given in Annex D.

Classification

The aim was to help users to find objects more reliably on the net. Classification tables were added and displayed in a search window. This is shown in the Finnish manufactured products service and also in the search facility for the Equipment Service where Uniclass and Talo 90 were implemented. This offers some improvement for users but more is needed.

The next step was to make translations of a classification system to other European languages. Under the current I-SEEC project the Finnish Talo 90 (Building 90 classification system) was made available under a Linux-like policy for its use and was translated into Dutch and Italian. Iceland is currently translating the Talo90 classification and has developed tools for tree representation and control. The description of the system is made available in PDF format.

Translation

A commercial automatic translation application “Babelfish” has been incorporated into the CONNET front page and in the Equipment page by BRE. This allows these and subsequent pages to be translated. A limited set of languages is available - for example Dutch is missing. The actual result of a translation can vary in quality, but an impression of the content presented is given. This has a different function to the search tool – it is for aiding a user’s understanding of the text in the services’ web pages.

These approaches, while helpful, have a limited functionality and efforts have been made to develop some other ideas as described below.

2.5.1 Multiple Language and Classification support in I-SEEC

As the Internet grows, so does the amount of information available through CONNET type services, and consequently the difficulty of finding what a user requires. This is the main infrastructure topic tackled under I-SEEC.

Simple string-search systems rely heavily on the user for knowledge of the domain being searching and on the information provider for proper domain-specific indexing. An open technical terminology would help both parties. This problem is certainly clear for systems providing cross-language services.

The use of a structured terminology is one of the ways to tackle this problem but in practice the classes defined in Construction Industry classifications are limited to the intended use, i.e. mostly organisation of information like specifications, budgets, planning etc. On the other hand there is not yet an exhaustive internationally accepted classification available. Classification codes are currently mainly used within manufactured product information systems. They can, however, only be used within such a system and often the classification systems are not openly available without copyright conditions.

Another approach to improved information searching is through the use of language tools that assist in broadening or narrowing (generalise or specialise) a string search, by

integrating (this object is part of …) or decomposing (this object is composed of the parts…), by referring to related terms or expressions, by using synonyms, preferred terms and explanations, definitions or scope notes.

Recently applications have been developed like Plumbnet by ThinkMap in the USA and the so-called Aquabrowser in Holland, both relying on an extensive thesaurus and visualisation of the relations between terms. However, there is no general lexical database or specialist vocabulary in construction available that could have been used directly in the I-SEEC project.

The necessity to have a common terminology available has been widely recognised and resulted recently in the approval of an ISO “Framework for object oriented information exchange” with anticipated deliverable “Framework for Terminology”. (ISO/ PAS 12006-3). The development of the content of this framework is estimated in Holland to require some 25 person years’ work.

2.5.2 WEB Thesaurus

So the approach taken in I-SEEC, based on earlier experience of TNO (using Datawares BRS in an on line pilot) and IKPIR (Geodetic Thesaurus, Web version of Canadian Thesaurus of Construction Terms) was to implement a relatively simple language toolset, based on thesaurus technology and the possibilities of a web-oriented database.

To develop content within I-SEEC’s time frame, the strategy chosen was to collect as much existing material as possible (including freely available material from the Internet). Co-operation was sought with the Dutch BAS Association that integrates all the Dutch classification efforts of all sectors and links directly to the international development platforms. Extra financial input was obtained from STABU, the Dutch National Specifications Institute. The terminologies collected in I-SEEC will be made available to assist in the development of the WEB Lexicon (based on the ISO framework).

The combination of thesaurus technology, lexicography, multi-language terminology etc. was combined in a tool that was called the Web Thesaurus. Basically, languages are treated as synonyms, classification classes are treated as synonyms, and terms and expressions are explained or defined in the Scope Note when there is a formal description available. Thus an extensive construction-oriented terminology has been built that can be used for multi-language and multi-classification search and indexing.

The Web Thesaurus is a database of terms and concepts used in the AEC industry. Thesaurus relations have been added and terms in other languages and various classification classes they describe are represented as synonyms. Definitions and explanatory notes are given with a graphical illustration where useful. The web-thesaurus aims at being a helper in indexing and retrieval of AEC “objects”. A prototype/demonstration model is to be found under http://thesaurus.forAEC.com/.

The Talo 90 (Manufactured Products table) was made available in 3 languages (Finnish, English, Dutch, Italian) with inputs from ICITE and TNO, and it is hoped to add Icelandic and Slovenian. The European Common Procurement Vocabulary (CPV) was reduced to

terminology relevant to construction in eight languages. Dutch-English versions of the NI-Sfb classification tables 1 and 2 were made available by TNO, together with a construction Equipment and Tools classification. The Torroja Institute (IETcc) provided a Spanish-English construction terminology. The EPIC vocabulary was made available in English and Dutch and probably French will soon follow. The RAL Colour terminology is available in four languages. An English-German vocabulary was obtained from the University of Stuttgart.

IKPIR published all this terminology data on the Internet as searchable hypertext databases under a common user interface with a CONNET-compliant application interface. The URLs are http://words.forAEC.com/ and http://thesaurus.forAEC.com/. The IKPIR Institute hosts both servers.

The formal co-operation with the BAS Association will also result in a copy of the standard mechanical components library and most probably also the electrotechnical library, both in Dutch.

TNO will continue to use the WEB Thesaurus as the collection tool for additional data as it becomes available.

The search engine in the CONNET site uses the WEB Thesaurus database to expand any search word into the other available languages.

Further information is given in Annex D.

2.6 User's view of services

It is tempting to suppose that all European users should use a single portal to construction information and, indeed, in the UK such a national Gateway was once proposed. The business model for such a centralised entry to information services is attractive as, by definition, advertising revenue could be maximised with 100% of users being exposed to advertisements. In practice, the last year or two have demonstrated the sheer impossibility of obtaining 100% agreement on a single national portal let alone a European one. Indeed, personalisation has become of considerable interest in all web-related endeavours. The CONNET model is completely in harmony with the latter. We start by assuming that users from country X will have strong connections with organisations, companies, institutions in that country; that they will have developed some trust in one or some of these and will have learned to trust their brand name. It is therefore most likely that they will turn to a portal within their own country in the first instance for quality information. We therefore envisage the following route as the most likely one to be taken by an average user (individual preferences and situations will of course lead to different scenarios) of the CONNET systems:

a) In the course of everyday work, establish the need for some technical information – typically in the form of How do I do something? Perhaps maximise solar gain and minimise energy consumption in a new office block.

b) Form a view based on past experience and raise some further questions.

c) Consult with colleagues or trusted advisers – perhaps though a search on internal documents, or direct contacts.

d) Test ideas or check on constraints by consulting literature covering Codes and Regulations, Guidance notes, Case Studies, Product literature. This could be through an in-house filing system or library. In some cases (not very frequently at the moment) there may be an in-house Lessons Learned database or facility.

e) Increasingly though, we would expect some form of web-based search to be conducted and this should be via the trusted local source(s). Let us suppose that the BRE bookshop (also now the Construction Plus bookshop) in the UK Gateway is the first port of call. A search for “passive solar” (these terms are joined by logical ANDs in the search string) gives 8 hits with publications from 3 publishers, of which some are of possible interest. The abstracts for any of these can be examined and the document ordered online with a secure e-commerce facility. The search query can then be saved into a user profile so that any new documents added in the future can be notified to the user.

f) The same query could be widened to find information from trusted Internet sites via the UK Signposts service. This gives 48 hits. This facility has been added to provide access to a wider set of information sources – those available from some 20,000 web sites that are both relevant to construction and respected by the partners to this project. The Signpost to web resources service executes a full text search of a frequently updated index to these sites. Similar services are available for each country – for example, the Belgian set of French language resources.

g) This query can be widened further to ask all the UK services if they have any relevant information via the Search CONNET button displayed. This search currently returns results from the UK bookshop and Signposts as before, but also from the Finnish, German and Italian bookshops, the Calculation and Software Service, the Italian and Spanish Signpost services and two resources from the UK Best Practice service. One of the latter is a Case Study of an office building in Edinburgh that incorporates passive solar control and has received a very good environmental assessment rating.

h) If the design moves to more detailed phases and a decision has been made to install particular services, select or specify particular products the previous process can be repeated. Suppose now that the UK climate has persuaded the client to install a sauna – the UK bookshop returns two references from the Institute of Sport & Recreation Management. For more appropriate construction information the user can again simply widen the enquiry to search other non-UK services.

i) This currently results in information being returned from the Dutch, Finnish, German, Icelandic, Italian and Spanish services.

j) Suppose that the information returned by the IRB German bookshop is of interest and the user has limited understanding of the German language. A facility has been provided to perform online translation, say to English here. This can easily be

initiated by clicking the Babelfish link at the bottom of the Web page containing the Abstract text of the German publication. Subsequent pages that are displayed by following links will also be translated into English. While the quality of this translation will be far from perfect it should be good enough for the interested user to decide if it contains the information being sought. A direct e-commerce link allows this document to be purchased, and thereafter, human translation could be arranged. Because of the limited combinations of language pairs within Babelfish, it is clearly advantageous if the data providers provide their own translations of titles and abstracts (and possibly keywords) to one other commonly used language that is part of the Babelfish set.

k) If it is necessary to consulting an expert in these areas, a separate query could be made to the Who's Who services. Most of the services created to date have data on organisations rather than individual consultants but this is expected to change over the coming year.

In the above examples note that translation of search terms has been enabled through an invisible multi-language thesaurus. Although not all language combinations are catered for in the current system, this could be developed over time simply by the addition of translated terms to the thesaurus. An alternative search by browsing through a structured representation of commonly used classification systems is also possible in some of the services.

3 Findings

3.1 Utility, impact, quality of 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. We now have services in all participating countries and some linked services in two additional EU countries. Many of these are still at an early stage, with additional data being added and more robust marketing yet to be done.

In the following sub-sections the national experiences and impacts to date are described.

Finland

The BII manufactured product database is a significant achievement as it provides contact information for practically every building product on the Finnish market. It is only when a service can claim such comprehensiveness that serious use can be expected. BII feels that the I-SEEC project has enabled substantial acceleration in the development of its electronic information services, and is very likely to lead to an additional waste exchange service that would not otherwise have happened. I-SEEC has allowed VTT to integrate the BII and VTT technical publications service thus leading to added value and increased usability for the users. Since the launch of the localized commercial implementation of the Manufactured Products Service (RT-Net) on 16 January 2001 the service has generated some 1900 visitors and 75 sales. The database consists of 18,000 products and it is kept up-to-date constantly. There is a full-time employee gathering information and updating the database. The service also includes more than 400 product sheets, and a further 400 sheets will be added during the next 12 months.

The BII site as a whole receives 30,000 visits/month; this is very significant given that the biggest Nordic fair attracts only twice as many visitors (per year).

The manufactured product database service will be of significant importance. It will help to ensure that there is easy access to product information on environmental issues, CE-marks etc. The CONNET services are well positioned to enable rapid, up-to-date provision of such information to users throughout Europe and further afield, thus facilitating cross-border trade. It is important to note that once harmonised European standards become available, ALL construction products will have to be CE marked as a legal obligation.

Iceland

Internet utilisation is among the highest in the world In Iceland. New Internet portals and WAP-enabled services are constantly being created. The competition is hard and many are therefore short lived. This is also true for the construction industry. As in other European countries, the uptake of Internet technologies has been slower than in other

industry sectors. This has changed rapidly in the last two years. Internet applications have become important tools for most larger construction projects. The Industry is depending more and more on the Internet as a provider of information and for communication and information exchange. In this rapidly changing environment, the I-SEEC project has greatly reduced the time to market and therefore will gain a head start on other initiatives allowing time for co-operation and consolidation. The robust infrastructure of CONNET has also provided a platform for creation of quality services comparable with any available commercially. The European perspective of I-SEEC/CONNET also adds dimension and value to both information providers as well as users and encourages them to join.

It is expected that the services developed under I-SEEC and CONNET will establish themselves as they become richer in content and the business models become clearer. IBRI is already relying on the Technical Publication Centre for selling it's publications.

Italy

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 large 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.

Participation in the I-SEEC project proved to be very important for ICITE, since it has 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 they will be managed directly by ICITE in the near future.

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 3,000 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 will promote the I-SEEC project at the 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 the usefulness and effectiveness of these kinds 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.

Netherlands

Many portals have been launched during 2000/01. It is believed that few are commercially successful yet and some have begun to retreat or find difficulty in obtaining further investment. Many content owners are still competing rather than co-operating. More effort will be devoted to explaining the potential benefits of CONNET now that the systems are complete enough to demonstrate effectively.

A plethora of portals and websites that claim to be the one and only access to the Internet for the building industry have been launched in the past two years. IntraBouw/BouwOnline was one of the first to start in 1997 with a portal like site. Meanwhile BricsNet, BuildingPlaza, BouwNet, BouwPlaza etc. tried to win the market. Since 1998 IntraBouw experimented with ASP services like yellow pages, document- and project management.

TNO Building and Construction Research (300 plus employees), the main partner in I-SEEC, has no policy yet to have a commercial presence on the net other than the promotional website. Being a research organisation with a specific position concerning government financing, TNO is only allowed to develop its knowledge and information products for, and present through, third parties. The willingness to participate in European projects like I-SEEC and e-Construct is obvious. The results of the I-SEEC project are promoted on the Dutch market through www.bouwonline.nl. There are currently some 300-500 users per day of BouwOnline.

About 90% of the architectural and technical design firms are connected to the Internet. However, it is still used for little more than e-mail. Many employees do not have access to the WWW on their own PC. More than 60 % of the construction companies are connected. The actual use of the WWW is estimated at 10%. Generally now the management is convinced that the Internet is very important. Investment in b2b e-commerce, especially by the larger construction companies and manufacturers, is considerable. Outstanding examples of service to “end users” are available: www.rbb.nl (roofing products), www.gb.nl (fittings and fixings) and www.cadpages.com (Cad-O-Theek; parametric drawings in AutoCad; quantity take-off and STABU format specifications).

STABU, co-financing partner alongside IntraBouw, invests considerably in the development of effective primary (design and specification) process-oriented web applications (www.stabu.nl).

K-commerce, the sales of knowledge through the net, is still marginal. Some subscription services are operated by the Dutch research associations. It is expected that as long as the irrefutable identification of individual users is not generally available, the safe sale of “pages” (like standards etc.) will be dormant.

The Dutch effort to develop the WEB Thesaurus aims to provide “search and index” facilities to the market, and to improve the overall performance of the Internet today for the industry.

The participation of TNO Building and Construction Research in the I-SEEC project along with the other ENBRI Institutes and Building Centres will enhance and stimulate the consciousness of what happens on the net and what the future position of the R&D and Standardisation communities will be.

TNO is putting effort into getting the Belgian Contractors Federation to co-operate by making their 20,000 plus terms technical vocabulary in Dutch (Flemish) and French available to the WEB Thesaurus. An additional French-English vocabulary would then be a major breakthrough towards achieving a free Dutch-French-English general construction vocabulary and this will be very helpful in making the CONNET method of delivering information to users in Europe successful.

Slovenia

The developments in and related to I-SEEC and CONNET have been presented on numerous occasions nationally. IKPIR is well positioned to assume the role of a neutral co-ordinator of various providers of construction information in Slovenia. Around I-SEEC a central gateway to all Slovenian services is maturing. GCS will seek to make information on best practice Quality Marked products and processes available through a Slovenian Gateway. The Calculation and Software service is generating quite high usage figures and a ratings function should help to increase its attractiveness.

Spain

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 all the functionalities of CONNET. The CONNET initiative allows development at a European level with the extra potential 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). These are now available through the I-SEEC search facilities. Through a national Technical publications service it is also possible to establish a connection with the main databases in Spain. This provides access to information about all the publications (662,159 references since 1972) and doctoral theses, belonging to the Ministry of Education (MEC), the Centre for Scientific Information and Documentation (CINDOC), and AENOR - the private institute for normalisation and certification in Spain.

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 and the needs of the many 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.

United Kingdom

In the UK several portals have been launched, some UK in origin and some with a strong US bias. There have been some early failures in which the venture has collapsed. Many of these services concentrate on the sharing of project-related documents, which is not the main goal of I-SEEC. BRE has been able to develop, test and establish a technical publications bookshop that has now been adopted by one of the strong commercial players, Construction Plus. The CONNET and I-SEEC projects have been important in achieving this very promising result. Current sales are growing steadily and future projections are that the service will be viable for BRE and will deliver a very real improvement for users seeking technical information. The comments received from Construction Plus and others have been very complimentary.

The ease with which this service was able to be linked in to another commercial bookshop from Germany to allow direct purchase of IRB publications was also a very positive result, which suggests that new services could be added at low cost for new entrants.

Other services developed or integrated into CONNET under I-SEEC do not have such a clear business model and a period of further operation and feedback is needed before firm decisions can be made about their viability. BRE currently views several of these services as free value-adding ones that will receive substantial usage from UK and English-speaking users and will encourage them to make use of the other services available through CONNET.

3.2 Commercial issues

This section brings together the information relating to the business aspects of the services – the issues, problems, solutions and expectations.

3.2.1 Technical Publications and Bookshops

The annual turnover of the BII bookshop is 1.8M FIM and 10% of this comes from the electronic bookshop. The latest statistics on usage show 2800 user sessions/month.

An e-commerce service will be hosted in Italy in the near future.

There is no intention to sell publications via the Slovenian service for the moment, but this will be reviewed over the coming year.

IETcc's status prevents selling publications from other organisations. The Spanish service included also links to AENOR databases containing Regulations, Standards etc. with its own commercial model.

The UK model is for the operator to negotiate a % fee of gross sales with each publisher and some 50 publishers have signed up to date. Recently a major commercial portal has entered into an agreement to host the BRE bookshop with a click through agreement to share profits on sales generated from their site. Construction Plus (C+) will promote the BREBookshop.com as a key utility and will undertake a marketing campaign, with significant spending on advertising. The business model adopted is for a split of gross profit between BRE and C+, with profits generated on a negotiated commission between BRE and each publisher. The considerable extra marketing and exposure for this service is expected to be particularly valuable and future plans envisage a continued doubling of sales each quarter over the next 12 months.

3.2.2 Internet Signpost Service

Most partners regard this as a free service but an example was quoted from Dutch experience of how a service started free but was later bought by a commercial company. There are no plans by any partners to make this a charged-for service.

3.2.3 Calculation and Software Service

This international service has been running for some time. The site receives quite considerable use already. It is currently a free service with no payments for adverts. The developers and current host, IKPIR Slovenia are exploring ways of commercialising the service. They are currently conducting discussions with several CONNET partners with a view to share the costs of:

(a) Maintaining and operating the service

(b) Soliciting additional data from software vendors

(c) Promoting and marketing the system

(d) Improving the functionality

It is proposed that partners share profits in proportion to the value of the roles that they play.

The business model is to secure advertising revenue from major vendors and to take a commission from sales generated through the site.

The usage figures and breakdown of vendor countries given above show that there is potential – some 7500 unique visitors making more than 10 visits to the site.

The 1200-plus publishers of software for the built environment are drawn from a wide range of countries, but only UK, Germany, France, Italy and the Netherlands feature in the top ten (by number of vendors).

This shows a clear need for greater identification and promotion of European A/E/C software for the European industry. In view of this, the plan for the next 12 months is

likely to concentrate on items b) and c), with an emphasis on European markets and on making arrangements with commercial organisations that can conduct significant marketing for the service. This will be discussed in more detail over the next 2 months.

3.2.4 Waste Exchange Service

The Waste Exchange Centre provides a valuable resource to a small portion of the whole construction process. However, the impact of this process on the environment can be quite major and causes major problems (health and safety, cost, image, etc) for the industry. This service addresses both national and European goals for waste reduction and recycling in the industry. It is usable by a large number of practitioners in this field (57% use the Internet for business) and, with the automated notification services, provides a quick method to identify recyclable waste or find a recipient for excess and demolition materials.

The greater emphasis being placed on sustainable development and better use of limited resources is likely to encourage the exchange of waste materials. This new emphasis can now be seen in the legislation of several European countries and this will contribute to making this service more viable commercially.

The Chamber of Commerce of Slovenia (INFOLINK) has a similar service for the whole industry but only a few announcements per month have been generated. This is thought to be due to lack of promotion and due to the fact that industry partners normally manage the transactions themselves.

The service to be taken over by BII is a service that is expected to add value to the BII website. The annual costs are low and the intention is to cover the costs by banners. No income or losses are expected.

An Icelandic exchange service will be created in the near future, as an extension to the existing service. This will be aimed at the public that responds to newspaper small advertisements. The service will charge the party placing the advertisement when a transaction is made.

IKPIR will offer the Slovenian service that has been developed to any interested party in Slovenia for use and further development.

The UK has a system available through CONNET and is currently in discussion with a commercial on-line provider with a view to creating a commercial service. It is felt that such a link is needed, together with serious marketing if the service is to be viable. An auction facility may be added. This is expected to increase its attractiveness and enhance commercial possibilities.

3.2.5 Manufactured Product Service

The Finnish system developed under CONNET has been integrated into the CONNET services. It has 18,000 products, 2,500 firms and 400 product sheets. The information provider pays for the product sheets. There are different levels of access whereby users can see more/less information.

The MPS service has two levels. The first is classified information, enabling the user to search for products and companies. The second level adds a product sheet and extra files like CAD-files to the first level. Information at the first level is collected by BII. At the second level the information provider is charged a fee for the product sheet and the extra files.

In the commercial MPS launched 16 January 2001, access to the product sheets and information corresponding to these can be used free of charge, as it has already been paid for by the subscribing companies. A user who wants access to the whole database has to pay an annual subscription fee, the idea being that in this case BII sells information it has collected themselves. The full service is also on CD as an integrated part of BII's large RT information files containing design guidelines, standards, building codes, regulations and product information.

The service has already generated some 1900 visitors since launch that have led to some 75 sales. To put this into context, note that there are ~2500 architects in Finland. The BII site as a whole receives 30,000 visits/month, which is very significant given that the biggest week-long Nordic fair attracts only twice as many visitors (60,000), once per year.

This is a service of considerable commercial importance and is likely to grow considerably if the predictions of growth in e-commerce are to be believed. Cross-language identification through keywords and classification codes implemented through the thesaurus will help to make the system more useful to users and should also help to generate more business. The inclusion of CE marking information would make this of great importance in view of the role that such a scheme will play in encouraging cross-border trade. The CONNET MPS system is well placed to enable access to such information rapidly and at low cost to the many SMEs in this industry throughout Europe.

3.2.6 Who’s Who Service

Most partners regard this as a free service but there is an example from Dutch experience of how such a service started free but was later bought by a commercial company - Ten Hagen Stam Publishers- BouwAlmanak.

The Finnish model is to create a book with a CD (the current position) and to add a website in the longer term. The latter would include a payment for access. The Finnish Who's Who contains two databases: organizations and experts. The experts' database is part of the book Builder's Calendar, which is a profitable commercial product, adding value to the book and thus increasing its sales figures. The organisation database is maintained by BII as a value-adding service, the task of which is to generate traffic to the website.

Iceland has set up the mechanisms to allow registration and payment in its service. Upon registration and receipt of payment the user is issued with a user account and a password and can then enter and maintain information on competences etc. and view billing details. There are still some legal issues to resolve before the system can be used commercially.

Slovenia has set up a service that is currently free but intends to review the viability of the Icelandic model.

Most of the other services created by partners are currently restricted to information on organisations rather than individuals for reasons described above. As these are extended to include individuals, so the commercial value of them will increase and the potential for introducing commercial models will be reviewed.

3.2.7 Specialist Equipment and Facilities Service

The information contained in the services created to date refer mainly to test facilities and are an additional form of marketing for the information suppliers. To create a marketplace for equipment available for hiring would take a considerable commitment on the part of the many suppliers. It is not felt practical to achieve this within I-SEEC and hence the test facilities and equipment service content was created for 3 organisations (BRE, ICITE, IETcc-CSIC). An additional existing service from Slovenia has also been linked to CONNET. It should be noted that the information required, even for the test equipment service, is often not readily available in a suitable form and takes considerable effort to create.

Now that the service functionality has been created and some progress has been made on suitable classification codes, it would be possible to begin discussions with national organisations.

3.2.8 Best Practice Service

The most developed service is that for the UK. It is likely to remain a Government funded service for several years to come but at some point the need to cover costs may lead to a pay-per-use outcome.

Finland is seeking to draw on separately funded projects like those in the VERA programme to provide data for the service, while GCS will use in-house information on the Slovenian Quality Mark.

In the Netherlands a service to enable lessons to be learned from mistakes is being considered. A database is currently freely available but not yet implemented. The publisher is not yet ready for net publishing. Such a service is operating in Germany (IRB).

This service is potentially of considerable commercial value, but there does not yet seem to be the right market conditions for construction professionals to be willing to pay for such information. Clearly, their willingness to pay will be very strongly linked to how relevant the information is – and this is likely to need to have strong immediacy. Discussions with industry do indicate the willingness to pay for solutions to real problems that are being faced right now. It is interesting to note that activities related to what is called ‘Knowledge Management’ are being accorded very strong importance, at least in the UK. One central part of this is the ability to first of all recognize and record the ‘best practice’ knowledge, but also to be able to find it conveniently and very quickly. This

requires improved and targeted search engines, which is a strong part of what CONNET/I-SEEC has to offer. The Movement for Innovation's attempts to learn from innovation in real construction products has led to a new Web service known as the Knowledge Exchange. BRE's links with this and the Best Practice Programme (as developer of the web tools) should enable stronger links to be made to CONNET and early intelligence on when the climate changes to the extent that commercial systems become viable. BRE itself has a strong commitment to developing services in this area as witnessed by the recent formation of a Knowledge Division, with an on-line Advisory Service as one of the services to be developed.

3.2.9 Thesaurus Tool

A business model was developed and presented to the I-SEEC project members, the BAS Association and STABU. Whilst the organisations that own IPRs want to make the terminology generally available over the Internet, they do want payment for the added value that is produced by the descriptions/definitions and references to the formal status of the term or phrase.

Companies involved in commercial translation systems oppose the free presentation of synonyms in different languages. Luckily it is not possible to copyright language as such.

The open and free co-operative model I-SEEC employed and the results in the form of the CONNET network foster the availability of a generally applicable free construction terminology. Through the Web Thesaurus, I-SEEC supports the development of the formal language as envisaged in the WEB Lexicon.

Several problems were identified during the project. Several net-based glossaries exist, but thesauri are scarce. Those that are available are either not specialised for construction, are available only in one language, require considerable copyright expenditure because they are commercial ventures, or they don't facilitate the use of APIs as required in I-SEEC. The required investment to continue the WEB Thesaurus effort is estimated at about 100 -200 kECU/per Year. The results will be permanently available on the net.

3.3 Future Plans

As a result of this project, good working relationships have been built up between the partners and a valuable exchange of views and experience achieved. All of the partners have indicated a willingness to continue collaboration in the future. This section outlines the current proposed actions of relevance to CONNET/I-SEEC.

3.3.1 Lessons Learned for the future

(a) Agreement on basic data structures for information services has important benefits for both users of the systems and for the amount of effort needed to create additional services for new partners

(b) Sharing of experiences in this rapidly changing field can be very beneficial – some partners have been able to make substantial savings in effort and time to create new national systems and services.

(c) Sharing of code and joint testing makes good sense - it has allowed more rapid development for all. The pooling of such resources could be continued in the future to create something like an Applications Service Provider role.

(d) The success of electronic information services, as with traditional products and services, depends on filling a real market need. To some extent, the solutions to these needs have to be demonstrated before customers appreciate just how great their need is and change their attitudes to allow payment for quality services. The services now available will be helpful in this.

(e) I-SEEC has enabled services and functionalities to be created in all partner countries, but there is more to do to ensure that the overall user experience is such as to bring customers back and to create sufficient revenue to make the services viable commercially. Some of the services already have an impressive content (for example most of the publications services, the UK best practice service, the Finnish manufactured products service), but others have only limited data (for example the Specialist Equipment and Facilities services). More time must be allowed to persuade information holders to understand the potential and for them to collect information in the required electronic form. In addition to the quality and quantity of information that the services can provide, it is also essential that users find the web services easy to use. Some of the facilities provided (for example the translation tool, the enhanced multi-lingual and multi-classification tools) are very helpful, but a period of use in practice and feedback from users is certain to bring forward ideas for further improvements. This should form an important part of the work in 2001.

(f) The whole project is about the dissemination of construction information, but information about CONNET/I-SEEC is itself very important. Although presentations, seminars and documents have been produced during the course of I-SEEC, more needs to be done. The major need is for actual demonstrations of what the systems can do. It is only now becoming worthwhile to do this now that the systems are in a more complete state than hitherto.

(g) Some tools have been developed here to overcome problems of natural language differences. It is becoming more usual within the EU to assume that most professionals will be able to understand one of English, French or German. It should be a priority for future developments to ensure that the coverage of technical information and their ‘classification’ (or equivalent through synonyms) is good for at least these three languages.

(h) During the course of this project, the world has seen the explosion of financial interest in Information Technology ventures, followed by the collapse in confidence in dot.com companies. This cycle is regarded by most as a temporary and essential settling of the market. It is important to appreciate that such commercial services take time to develop and that they require real marketing budgets. Most of the

services within CONNET/I-SEEC still need both more time and more positive marketing. The partners are willing and are making positive efforts to do this.

(i) The systems developed vary considerably in type – some link to, or integrate with, existing systems and some have been developed from scratch based upon the data models specified in the project. This variety is actually very positive as it has allowed different approaches and experiences to be exchanged and as it has demonstrated both that legacy systems can be CONNET-enabled and that new systems can be quickly created by use of database 'templates' and re-use of code. Deeper integration of some of the systems can be expected over the next year.

(j) One activity that the partners wish to carry out in the future is to obtain feedback from use of services in practice and to share these experiences (for example BII will have feedback from a survey to be conducted on the Who's Who service. The collection of user comments and usage statistics is essential for the development of sound business models for future expansion of services.

3.3.2 Future collaboration on CONNET-enabled systems

The current I-SEEC partners have all expressed a wish, in principle, to continue collaborating after the end of the I-SEEC project. Some basic requirements to allow this to happen have been defined:

a) Set up new legal entity to enable collaboration between current CONNET-enabled systems to continue.

b) The aim should be that this should be not for profit and not for loss and that costs be kept as low as is consistent with its objectives.

c) The central infrastructure to allow national web-based services to operate and co-operate must be maintained (unless a different architecture obviates the need for this in the future).

d) New countries/organisations should be encouraged to CONNET-enable their services. It is proposed that any organisation offering CONNET services should join the new entity and be bound by its rules.

e) The rules should be set out by the members and established/altered by the agreed voting procedure.

f) The rules would include voting rights, obligations of members, decisions on new members, continuance of existing members and all matters essential to the continued success of the entity to enable a high quality set of electronic information services for the construction industry.

This 'European Gateway' is currently hosted at BRE. BRE has expressed willingness to continue to maintain this at cost, but equally would be quite happy for one of the existing partners to take over this role. It is proposed that members of the new entity should make this decision, using whatever voting rules are agreed. A vote conducted of prospective partners has confirmed BRE's role for the next operating year.

There are currently some 11 organisations from 7 countries. The goal should be to grow to 15-20 organisations from 10-15 countries over the first year.

Key tasks will be:
1. Operation of the central infrastructure – maintain hardware, software, documentation, models, APIs; conduct backups, provide usage statistics
2. Review suggestions for changes to infrastructure and implement where agreed
3. Review and agree a minimum set of rules designed to maintain quality of services offered by members
4. Review and approve Data Models, APIs for any new services to be offered by CONNET-enabled systems
5. Co-ordinate and valorise opportunities for promoting services offered by members
6. Seek opportunities to develop further the systems and promote widespread take-up of electronic information systems

Expected Costs:

Operator+ ~5000 Euros/pa	Operation of the central infrastructure – maintain hardware, software, documentation, models, APIs; conduct backups, provide usage statistics; admin. Costs to run EEIG compile accounts etc.
Members shared cost	Review suggestions for changes to infrastructure and implement where agreed
Members shared cost	Review and agree a minimum set of rules designed to maintain quality of services offered by members
To be agreed by members; any costs to be borne by instigating member	Review and approve Data Models, APIs for any new services to be offered by CONNET-enabled systems
To be agreed by members	Co-ordinate and valorise opportunities for promoting services offered by members
To be agreed by members	Seek opportunities to develop further the systems and promote widespread take-up of electronic information systems

+ Operator to be elected by a simple majority vote of paid up members

The most suitable instrument to achieve the above objectives seems to be a European Economic Interest Group (EEIG). This has organisational characteristics that enable it to take on functions typical of permanent forms of co-operation (e.g. international product marketing network). It is similar to a partnership and has legal neutrality so all members are placed on an equal footing.

The formalities for formation are stated to be very simple – draw up a written contract, register at an appropriate registry of State in which the EEIG has its official address. The official address can be transferred between States. An EEIG can be formed for a limited or unlimited period. No start up capital is required and all forms of contributions are possible.

It is a very flexible instrument in that members can decide all financial, voting issues. It has full and autonomous legal capacity. It is governed by Regulation EEC 2137/85, which takes precedence over national law. It can enter into e.g. EU contracts.

It is important to note that its purpose is to develop/facilitate economic activities of its members (not just the EEIG).

An initial business plan was presented at the Milan meeting and subsequently a draft contract has been drawn up by BRE. Final comments on this are awaited at the time of writing. It is now expected that the EEIG will be set up in May 2001.

Membership fees will need to be agreed by unanimous decision of members (I-SEEC partners in first instance). Initial figures are given here to give a preliminary indication.

	Initial entrance/set-up fee (Euros)	**Annual fee (Euros)**
EEA organisations	0? To be decided	500
Non-EEA organisations	To be decided	1000

3.3.3 Extension beyond EC borders

During the course of both CONNET and I-SEEC, efforts have been made to publicise the objectives and progress being made, both to European countries and beyond. Annex E gives some further information on contacts made and expressions of interest received. It seems that the non-competitive model adopted, the sharing of experience, information, resources and tools is very attractive. Strong interest has been expressed particularly by Canada, China, Croatia, New Zealand, Yugoslavia. Interest has also been expressed by several of the 'Applicant (to the EU) Countries'. The relative lack of knowledge about facilities in these countries would seem to make such an extension very interesting.

One particular service that seems to have considerable potential is the Manufactured Products Service. This has clear potential for lowering barriers to trade and for enabling rapid access to up-to-date, quality information to designers, specifiers and procurers. There is activity in many countries but so far without too many clear leaders. It is an area where sharing of resources, agreement on basic data structures and definitions and a non-competitive model which allows separate services to allow the market to determine the eventual winners is essential. It is particularly well matched to an electronic information service in view of the fact that the products must be accompanied by additional information governing not just their basic properties but also guidance on their installation, suitability for a variety of purposes, illustrations of good practice in maintenance etc. This need for a combination of 'knowledge' about products forms a strong justification for the use of electronic delivery. It is in fact an opportunity to make use of the increasing functionality of knowledge-based/knowledge management tools and could be very effective. The increasing emphasis on functional performance of construction products and the CE marking scheme, whereby it will become a legal requirement to CE mark products, should be strong drivers encouraging use of MPS systems. Work already underway in China on an HVAC system and in Canada on providing real context-based knowledge and in the UK on online Advisory services could fit very well with the existing services.

Experience from the UK's Construction Best Practice Programme has been very encouraging and the on-line provision of advice of all sorts could well be emulated in

other countries. Sharing experience across country boundaries has great merit and extensions of these services should be considered.

The data structures, definitions etc. used within CONNET for the existing services have been based on standards where they exist and it is expected that as richer standards appear through the use of XML etc. these can easily be incorporated. It is anticipated that projects such as eConstruct will be of importance in providing usable standards and CONNET partners have been active in preparing new plans for work that would allow continuing developments to make use of these. The extension to new countries and services would add value for all and would, as already demonstrated, lower initial set up costs for new entrants, reduce risks and lead to increased and freer market for products and information.

The existence of commercially viable electronic information systems in EU, EEA and other countries would be an important means for promotion of opportunities arising from decisions, wishes and interests of the EU's Enterprise DG. It would seem appropriate to encourage other EU organisations to join the CONNET EEIG and to extend Associate status to Applicant countries and other countries representing key markets for Europe.

3.4 Participation – companies, take-up and understanding gained

The partners to the I-SEEC project come from a range of organisation types:

- Building research institutes – both government and private
- Building Centres
- Universities

Some of the partners have entered into collaborative arrangements with commercial companies, either to develop, to operate or to supply information for the CONNET services. Some of the 35 or so services now offered by partners are newly developed whilst others have integrated existing legacy commercial services.

Partners started from very different positions – some already quite well advanced in the area of electronic information provision, others just at the stage of appreciating the importance whilst having no services in operation. For all of the partners, I-SEEC has been a valuable opportunity to examine and test ideas, to compare different approaches and to review needs and opportunities in the context of their national contexts. Without a doubt, everyone has gained an improved understanding. The ability to define system functionalities, to implement them and to start to populate operational systems with real information has allowed an assessment to be made of the commercial possibilities of operating such systems in the future.

There is no single business model that will work for all countries and it is clear that for some organisations, existing rules and policies would prevent the adoption of a fully commercial operation at the moment. This is a very dynamic, fast moving field and both technology and attitudes will continue to change. What has been achieved within CONNET and I-SEEC is a level of understanding that serves as a good foundation for

each of the partners to test ideas and to make informed assessments on how best to serve their organisational and national aspirations in the future. It is pleasing to see that some of the services are already looking successful and obtaining recognition by end users. Many of the systems have not been operational for long enough for firm conclusions as to their future potential to be made at he time of writing.

It is encouraging that interest in the project, its concept and the possibility of collaborating has been received from a wide range of countries both within Europe and wider (see Annex E). It is also very pleasing that within the project it has been shown possible to incorporate a commercial system from Germany and to set up a new one for Belgium. All of the services will benefit from the additional coverage that is gained from 'CONNET-enabling' of further high quality systems.

3.5 Plans for the next 12 months

Finland

BII will finalise arrangements to take over and operate a waste exchange service from their own site.

BII intends to develop an Internet Who's Who service using the I-SEEC API as the basis. This will be informed by gathering and analysing user feedback on the existing CD database. As for other countries, efforts will be made to move towards adding information on individuals once consent can be obtained. It is expected that this will increase the commercial value of them and necessitate reviews of the business model.

VTT will seek to add information from the VERA programme and elsewhere to the Best Practice service.

Iceland

The Icelandic technical publications site is being introduced to a number of interested parties and government organisations. These include the Technology Institute (150 publications), universities, the National Standards Institute and several other publishers of construction-related material.

The existing waste exchange service will be extended to offer a service to appeal to the current public service operating through newspaper small advertisements.

Discussions will continue with various associations in order to further populate the Who's Who service.

Funding is currently being sought to establish a Best Practice service.

Italy

ICITE plans to create a national Italian service in collaboration with Infoweb, an Internet company, oriented to the design and realisation of thematic portals and to the design of websites. The technical publications service will be included in the INFOBUILD portal to be developed by Infoweb in co-operation with ICITE. A collaboration will be started with a

trading company that sells books via the Internet (like Amazon), to allow users to buy books directly from the service. ICITE will receive a percentage on the cost of books sold through the CONNET service. It is currently planned to launch this service in April 2001.

Discussions about possibilities of setting up a waste exchange service will be continued.

Discussions are currently underway that may lead to establishing a Best Practice service.

Netherlands

TNO and IntraBouw will discuss the use of the CONNET data models and thesaurus to overcome existing problems experienced by private waste exchange services in the Netherlands.

Discussions with BouwOnline will be conducted to further develop Who's Who services.

Discussions are currently underway that may lead to establishing a Best Practice service based upon lessons learned from past mistakes in construction projects.

Slovenia

Partners to exploit the waste exchange service will be sought.

Discussions will continue to obtain commercial support for the Calculation and Software Centre. Additional European vendors will be encouraged to add information about their products.

Business models for a Who's Who service will be considered further.

GCS will consider setting up a CONNET site, addressing, in particular, the Quality Mark products and services as examples of Best Practice.

Spain

Plans will be developed to move the current services hosted at BRE to a server in Spain.

The inclusion of AMIET publications in the CONNET service will be considered.

Negotiations to develop a waste exchange service will be continued.

The Specialist Equipment and Facilities service will be extended with additional data.

Discussions will be held to attract interest for a Best Practice service to be created.

UK

The BREbookshop will continue to negotiate new deals with additional publishers (already deals have been signed with more than 50 publishers) to add to its breadth of cover and will absorb existing deals and publishers with whom Construction Plus had agreements. This will further strengthen BREBookshop.com

Discussions will continue to obtain commercial support for the Waste Exchange service and for the Calculation and Software Centre. Efforts will be made to encourage additional European vendors to add information about their products.

BRE has received national funding to develop certain aspects of a Manufactured Product service, in particular the use and demonstration of the IAI's External Libraries concept. Further opportunities to create a commercial service will be explored.

The Specialist Equipment and Facilities service will be extended with additional data.

Planning is underway to create a new online Advisory service. Consideration will be given to incorporating this within the set of CONNET services and links to other developments of a similar nature will be sought.

The CONNET EEIG will be set up if sufficient interest is received; this is already at an advanced stage and it is expected to be in operation during May 2001. BRE will use its best offices to provide information and promote this initiative so that the existing services can be improved and extended and new ones can be developed.

4 Conclusion and recommendations

1. 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.

2. Working as an open initiative has enabled national gateways to be established, that allowed providers in each nation to be brought together for greater benefit to all involved.

3. The infrastructure allows (through lexicon-based translations and classification mapping) queries to one information system to be referred to other CONNET-enabled systems and a more comprehensive and consistent set of results returned to the user.

4. Through the integration of active technologies it has also been possible to provide for enhanced technology transfer based upon user interests.

5. 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.

6. The development of a thesaurus of technical terms has demonstrated a powerful means of addressing problems caused by different natural languages. It will be interesting to see to what extent cross- nation and cross-language information transactions are used in practice during future operation of these services.

7. The infrastructure, definitions and code developed in this project have substantially lowered the barriers for new entrants to develop systems under the CONNET network in future. CONNET-enabling new and existing systems will add value for all users and help to reduce barriers to trade.

8. The CONNET infrastructure has been designed so that it can easily take advantage of new standards that may be developed and adopted as a result of other initiatives such as aecXML, bcXML IAI IFCs etc.

9. Further work is needed to test and populate services, inform potential users about them and obtain feedback from users. Several partners are interested in setting up additional services but need to hold discussions to obtain buy-in and secure support.

10. This project has achieved a great deal but additional time is needed to make an informed assessment about the viability of some of the services. It has been agreed that it would be of great value to maintain the good working relationships that have been built up between the partners, to exchange information and views and to assist others to add additional CONNET-enabled systems to the network. A proposal to create a not-for-profit organisation to manage the CONNET infrastructure and products has led to a draft agreement for a new European Economic Interest Group. It is expected that this will be in operation during May 2001.

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Presentatie project tijdens BouwBeurs 2001 in MediaPlaza op 8-2-2001.

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Robert Amor, Dave Bloomfield, Alastair Hutchison, Ignacio Inda, John Lambert, Angela Muthoni (BRE)

Vladimir Gumilar , Vladimir Pravica (GCS),

Gestur Olafsson (IBIC),

Gudni Gudnason (IBRI),

Paolo Cardillo, Elisabetta Oliveri (ICITE)

Benjamin Pena, Alfonso Recuero, Olga Rio (IETcc)

Tomo Cerovsek (IKPIR), Ziga Turk (IKPIR).

Anita Bouman, Marcel Groosman (TNO)

Juha Hyvarinen, Sami Kazi (VTT)

Annex A - Recommended system requirements for easy creation of new compatible systems

The topology of the current CONNET systems is shown in 2.3 above. Some guidance is given here on what would be required to implement a national gateway, or an additional CONNET service.

A typical machine specification might be as for that used by BRE.

It is important that the systems offer an acceptable level of performance to the user. This must take account of:

- bandwidth requirements (dedicated permanent connection with minimum of 64kbps)

- maintenance of systems and operational requirements (1 person on call with service level wait time of 12 hours)

- implementation of the minimum set of API calls that need to be supported for each service and for a national gateway, see 2.3 above and DM/API document;

- some services/tools can be provided by the CONNET consortium when they join (e.g. virtual technology park functions or re-use of code from the national gateways), as agreed by the CONNET partners

Annex B - Description of the data structures used by the API

```
ServiceID int
SystemID int
ServiceName String
URL String
Country String
ServiceType int
Parent int
ServiceLevel String
HelpDeskURL String
ElecEntryURL String
Certificate String
AssociationStatus int
ChargingStrategy int
OrganisationName String
Address String
Telephone String
Fax String
WebPage String
Email String
ContactName String
PostCode String
OrganisationType String
```

Attribute definitions

ServiceName: the name of the individual service as specified by the service developer.
URL: the starting location for the service through the Internet.
Country: the country which the service addresses.
ServiceType: the type of service provided as categorised by the initial CONNET developed services.
Parent: a higher level service which can be contacted for answers if this service can not provide a satisfactory result. This allows the connection from organisation based services through to national services through to international services.
ServiceLevel: a description of the level at which this service operates. Currently this defines divisions, organisations, national, and international.
HelpDeskURL: contains the starting point for the helpdesk associated with this service. This allows both bespoke helpdesks or centralised or shared helpdesks to be linked in.
ElecEntryURL: contains the URL to the API for this service.
Certificate: contains the certificate information for the service used to establish a secure connection with the service for the transfer of sensitive information.
ServiceID: this is the unique ID allocated to the service by the CONNET central system.
Users: Set of users.
AssociationStatus: defines the status this service has with the CONNET central system in terms of how integrated it is with the CONNET methodologies.
ChargingStrategy: defines the charging strategy employed by the service in order for CONNET to determine whether a particular user could use the service.
SystemID : The national gateway this service falls under.
OrganisationName: the trading name of the organisation.
Address: the mailing address of the organisation.
Telephone: main phone number for the organisation or service leader.
Fax: main fax number of the organisation or service leader.
WebPage: the URL of the organisation's web page.

Email: the email contact for the organisation or service leader.
ContactName: initial contact point for the organisation or service.
PostCode: mailing post code for the organisation.
OrganisationType: used to categorise the organisation. Currently captures information on university, membership based, research, standards, manufacturer, supplier, etc.

SearchResult

```
Title : STRING
text : STRING
url : STRING
logo : STRING
logoURL : STRING
price : STRING
serviceName : STRING
```

Attribute definitions

Title : the main part of the search result e.g. the title of a publication or a web site
Text : any other text associated with the result
url : a url to more details on the result
logo : url to an image to be displayed with the result
logoURL : link associated with the image
price : any price information for the result. This should include currency information
serviceName : the name of the service that provided the result

Annex C - Security issues

Security issues are of importance but can not be discussed in detail until a stable set of systems have been created (e.g. the Italian and Spanish systems will be moved to a new host shortly). The best recommendation is to follow BS 7799 (now ISO 17799) based on an appropriate set of risk assessments.

There needs to be a coherent information security framework for CONNET and information security will have to be proactively managed and monitored across all of the services.

The following indicates the questions and issues that need to be addressed.

- Who will own the information/products and so define the security policy for protecting them?
- Who will do the risk assessment for the risks to the site and service?
- How will this be done?
- Who will own the process and be accountable for keeping the risk profile up to date?
- Who will manage and monitor the security of the site?
- How does one determine who will have access to what information and segregate one ‘supplier’ from another
- What non-disclosure agreements are in place / required? – Under what jurisdiction?
- What does the confidentiality agreement look like for the partners / suppliers of information?
- What does the site privacy policy look like?
- What are the terms and conditions of using the site?
- How will the server be secured physically?
- Who will have access to change the contents of the site or even get to the server?
- How will the server be segregated – Firewall – which one, what will the rule base contain?
- What Intruder Detection software will be run?
- How will change management be performed and monitored?
- How will any incident be handled – escalation procedures?
- Service level agreements for access and their monitoring – what levels are set, who will monitor and what action is to be taken if the SLA is not met?

- Fault handling and the helpdesk?
- Malicious software?
- Updating with patches/ hot fixes or service packs
- What degree of tracking of user activity is required – is the level required permitted by law?
- What will you do with this information?
- Where will the Data Protection legislation be registered?
- What about contingency planning and business continuity in case of a problem?
- What legislation is applicable for each of the legislative jurisdictions applicable?
- What strength Crypto is to be used is it strong enough / legal for the purpose?
- How will keys be managed?
- How does one manage any development process and perform full testing – I am conscious that 'time to market' cuts time for testing. Who will accept the responsibility for agreeing 'go live'?
- What contract will be agreed for the site between the partners? – under what jurisdiction?

Legal

The following may need to be considered for the project and the contract between the partners / suppliers / others. Legal advice should be sought.

The contract should ensure that there is no misunderstanding between BRE and the third party. BRE should satisfy themselves that they had adequate and enforceable rights of recovery against their suppliers for, *inter alia*, breach of contract. The following terms should be considered for inclusion in the contract:

a) the general policy on information security;

b) asset protection, including:

1) procedures to protect the partners assets, including information and software;

2) procedures to determine whether any compromise of the assets, e.g. loss or modification of data, have occurred;

3) controls to ensure the return or destruction of information and assets at the end of, or at an agreed point in time during, the contract;

4) integrity and availability;

5) restrictions on copying and disclosing information;

c) a description of each service to be made available;

d) the target level of service and unacceptable levels of service;

e) provision for the transfer of staff where appropriate;

f) the respective liabilities of the parties to the agreement;

g) responsibilities with respect to legal matters, e.g. data protection legislation, especially taking into account different national legal systems if the contract involves co-operation with organisations in other countries;

h) IPRs and copyright assignment and protection of any collaborative work;

i) access control agreements, covering:

1) permitted access methods, and the control and use of unique identifiers such as user IDs and passwords;

2) an authorisation process for user access and privileges;

3) a requirement to maintain a list of individuals authorised to use the services being made available and what their rights and privileges are with respect to such use;

j) the definition of verifiable performance criteria, their monitoring and reporting;

k) the right to monitor, and revoke, user activity;

l) the right to carry out due diligence inspections and audit contractual responsibilities or to have those audits carried out by a third party;

m) the establishment of an escalation process for problem resolution; contingency arrangements should also be considered where appropriate;

n) responsibilities regarding hardware and software installation and maintenance;

o) a clear reporting structure and agreed reporting formats;

p) a clear and specified process of change management;

q) any required physical protection controls and mechanisms to ensure those controls are followed;

r) user and administrator training in methods, procedures and security;

s) controls to ensure protection against malicious software;

t) arrangements for reporting, notification and investigation of security incidents and security breaches;

u) involvement of the third party with subcontractors.

If outsourcing of the service (or any part of it) is undertaken, then the following should be considered:

The security requirements for the IoD in outsourcing the management and control of all or some of its information systems, networks, development, testing and/or desk top environments should be addressed in a contract agreed between the parties.

For example, the contract should address:

a) how the legal requirements are to be met, e.g. data protection legislation;

b) what arrangements will be in place to ensure that all parties involved in the outsourcing, including subcontractors, are aware of their security responsibilities;

c) how the integrity and confidentiality of BRE's business assets are to be maintained and tested;

d) what physical and logical controls will be used to restrict and limit the access to the BRE's sensitive business information to authorised users;

e) how the availability of services is to be maintained in the event of a disaster;

f) what levels of physical security are to be provided for outsourced equipment;

g) the right of audit.

The terms given in the list above this one should also be considered as part of this contract. The contract should allow the security requirements and procedures to be expanded in a security management plan to be agreed between the two parties.

Although outsourcing contracts can pose some complex security questions, the controls above should serve as a starting point for agreeing the structure and content of the security management plan.

Taking money over the net

Electronic commerce can involve the use of electronic data interchange (EDI), electronic mail and on-line transactions across public networks such as the Internet. Electronic commerce is vulnerable to a number of network threats that may result in fraudulent activity, contract dispute and disclosure or modification of information. Controls should be applied to protect electronic commerce from such threats. Security considerations for electronic commerce should include the following.

- *Authentication.* What level of confidence should the customer and trader require in each others claimed identity?
- *Authorisation.* Who is authorised to set prices, issue or sign key trading documents? How does the trading partner know this?

- *Contract and tendering processes*. What are the requirements for confidentiality, integrity and proof of despatch and receipt of key documents and the non-repudiation of contracts?
- *Pricing information*. What level of trust can be put in the integrity of the advertised price list and the confidentiality of sensitive discount arrangements?
- *Order transactions*. How is the confidentiality and integrity of order, payment and delivery address details, and confirmation of receipt, provided?
- *Vetting*. What degree of vetting is appropriate to check payment information supplied by the customer?
- *Settlement*. What is the most appropriate form of payment to guard against fraud?
- *Ordering*. What protection is required to maintain the confidentiality and integrity of order information, and to avoid the loss or duplication of transactions?
- *Liability*. Who carries the risk for any fraudulent transactions?

Annex D – Thesaurus

The Web Thesaurus - background

Building on the IKPIR previous experience with on-line thesauri, being aware of the above described concepts and technologies, and the work to be done in the eConstruct project, the concept of the WEB Thesaurus was further defined in I-SEEC.

The combination of thesaurus, dictionary and encyclopaedic methods have resulted in a tool to support searching, indexing, and knowledge transfer. This is an integrated multi-lingual, multi-classification database and knowledge management tool. The traditional thesaurus was enhanced with the possibility to define relations specific to the industry that makes objects. It is necessary to be able to define an object as part of another higher integrated whole.

It is a flexible tool primarily oriented to person-computer communication. It is catering for terminology originating from different countries and construction cultures, it can absorb new technologies, it helps to translate concepts but does not exclude the need for a certain degree of professional knowledge to use it and experts to maintain it. It shows where possible the context of terms and phrases, following the adage that information is knowledge only when placed in context.

When consulted it shows words and phrases in different languages and it treats classifications as a specific language. That makes it possible to search on a classification code and return the terminology that is part of that particular classcode.

Organisation

The Web Thesaurus toolset includes organisational instruments to support experts to communicate about terminology, to support editorial decision making, and to organise security and access at various levels. To top off the exercise, a virtual office (the Dutch BouwDesk Extranet application) was tested as an environment supporting the developers of the Web Thesaurus.

The Web Thesaurus needs a tool to manage off-line the terms and relationships. A prototype of this tool has been created, in parallel with the I-SEEC project.

Definitions

A thesaurus is defined as a specific set of terms that is used in a knowledge domain, formally organised so that relations between concepts are made explicit. It handles traditional relationships like broader term, narrower term, preferred term, synonyms, abbreviations, related terms, scope notes, etc. Thesauri and thesaurus technology were mainly developed in the library world to be able to index, store and retrieve physical documents.

A vocabulary, terminology or glossary mostly lists terms and the description or definitions. A bi- or multi-lingual dictionary mostly gives one or more translations without descriptions of the concepts involved. A lexicon can be a dictionary and vocabulary combined. An encyclopaedia combines mostly words with descriptions and images illustrating the referenced words or phrases restricted to one language. A phraseology is a list of phrases.

To be able to group concepts or objects, a classification or taxonomy is used. Hierarchical and facet classifications are discerned and used in combination in proprietary classification systems. Well known are the UDC, the Periodic Table of the Elements, the Linnaeus Flora and Uniclass. Depending on the application envisaged, various systems are operational in the European AEC industry:

- the originally Swedish SfB,
- the English and Dutch translations NI/SfB and CI/SfB, and
- the more recent Finnish Talo 90 and
- EPIC- Electronic Product Information Coordination group.
-

Apart from these, the Common Procurement Vocabulary (CPV) was developed by the EU in all or many European languages. AEC-related classes are part of it. The main aim of the classification systems in use is to organise information in specific documents like specifications and budgets and the ensuing quality and budget control. The CPV aims at facilitating European trade communication.

With increased use of computers, international trade and co-operation in design and construct processes, and the Internet of course, the demand for an international accepted classification system for construction objects arose and at last resulted in the ISO decisions referred to above. The new object-oriented construction classification is called the Web Lexicon. It will be instrumental in identifying objects unambiguously by their properties.

Specification of Functionality

The data model for the system to be used in CONNET is outlined below.

Structure of dictionary data

- term,
- scope notes,
- figure

Within scope notes there can be links to other terms.

Structure of thesaurus

The structure is standardised according to NISO and ISO standards. The thesaurus is divided into the following parts:

- basic data
- relations between terms
- implicit relations between terms
- multilingual data
- editorial data

Basic data:

- NLT: Dutch Term
- NLSN: Dutch scope notes
- FIG: Scope notes
- URL: Pointer to URL where can we find additional information on current term

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

Implicit relations:
On the basis of data entered a computer program can calculate implicit relations:
- automatically generates inverse term relationship
- automatically searches the hierarchical tree of the term, that are not directly connected to the term
- adds implicit relations from scope notes
- add links to thesaurus where other language is used as primary language

Multilingual data:
- UKT: UK term
- DET: German Term
- FRT: French Term
- FIT:Finnish Term
- EST: Spanish Term
- SIT: Slovenian Term

In each translation there can be multiple translation into each language. Relations between languages are not one to one. Organisation of the web thesaurus enables easy upgrading, with quite a high level of automation, to any other primary language.

Editorial data:
- CD: Creation date
- CB: Created by
- AP: Approval date
- AB: Approved by

Anybody can add a term; this is added to the list of proposals and an Administrator (Editor) reviews the terms, make evaluations, relations, translations and adds to the list of approved terms.

Description of Thesaurus Tool

A demo is running at http://thesaurus.foraec.com/data/nl. It displays synonyms and allows the user to broaden and choose a narrower term. A complete Dutch version of the thesaurus tool will soon be available.

The current system works in Dutch. Any other language can be set as the primary language, but translations need to be provided for the language engine as well as for displays, listings, forms, etc. The full data model is not yet functional. Some batch processing and integration tools also need to be developed.

Future Work

The first task is to extend the current system to be able to use any relevant classification codes that may be available in any stored information. The current system is to be extended by building a file that matches the first two digits from the manufactured products classification of Talo 90 (Construction 90, Finnish product classification system) with Sfb and EPIC classifications. This will be added to the thesaurus tool as synonyms and present them equal to the English, German, French, etc. translations in the header of the presentation page.

Collaboration has been agreed with STABU, the Dutch national specification organisation. They are working on a formal WEB Lexicon, a standard for "concepts" in AEC, that is also part of the European E-Construct project. Our project is regarded as a "funnel" to collect terminology "as is" which can then be used as a feeder to the web lexicon.

Co-operation of the Belgian Construction Industry Confederation has also been agreed on the import of their French-Dutch technical terminology (20,000 entries).

Contact with ICT regarding the mentioned qualified terminology of 80,000 Dutch-English translations has also been made.

The demo is available at http://thesaurus.forAEC.com/data/nl

Annex E - Information on Contacts Made

This Annex gives information on contacts made with non-I-SEEC partners, presentations made and planned for the coming year.

Australia

Discussions held at CIB W102 meetings, April 2001

Contacts expressing interest:

- I Close, Selector, Port Melbourne
- S Pahos (Business Development Manager),
- and Robin Drogemuller, Dept of Building, Construction & Engineering, CSIRO, Melbourne,

Austria

Prof. Sparowitz. ETH Graz, http://www.cis.tugraz.at/ibb – expressed interest - wants to develop similar services in the future.

Belgium

Presentation by D Bloomfield, EU event Brussels, 16 Nov 2000

Contacts:

- G Michaux, Direction des Spécifications techniques et de la Normalisation (D.425), Ministère de l'Equipement et des Transports (MET), Liège – creation of BelgianSignpost service
- E Jacobs, director of the Belgian Construction Contractors Federation,
- C de Pauw, director of the Belgian WTCB/CSTC , both co-directors of www.cobonet.be
- J Venstermans, BBRI

Canada

Prof. C Davidson, Faculté de l'aménagement, Université de Montréal and Convenor of CIB W102– expressed interest in collaborating.

China

- Xu Zongren, China Building Technology Development Centre – expressed interest in collaborating; invitation made to BRE to give keynote talk at UICB conference in Beijing.
- Prof Y Jiang, Tsinghua University and Tsinghua TongFang company, Beijing – expressed interest in collaborating.
- Y Deng, as above

Croatia
Attendance of D Delic, H Mestrovic at Ljubliana meeting, 4-7 September 2000 – expressed interest in collaborating.

Denmark

Morten Hjort, Byggecentrum – expressed interest.

Germany
Presentation to IRB, Fraunhofer by D Bloomfield, Stuttgart, 17 October 2000 and subsequent collaboration to integrate German bookshop.

Contacts:

- Dr W Wissman, Director Fraunhofer-Informationszentrum Raum und Bau
- J. Acevedo.

University of Stuttgart – collaboration on translation of terminology for Web Thesaurus.

Finland
Presentation by D Bloomfield, UICB, Helsinki, 14 June 2000

Iceland

Presentation to Icelandic Member of Parliament and vice president of state financial budget committee (E Kristjansson) – this led to recommendation for a grant of 3m ISK for further development of CONNET.

Scheduled promotion events in Iceland:

-	early April	Article in the quarterly magazine aVs Promotion brochure sent to potential information providers / clients
-	end of April	General promotion - newspapers, radio/tv - sectional publications for the building industry
-	1st May	I-SEEC opened for information provider registration
-	15th May	Formal opening of I-SEEC
-	June	Follow-up promotion, IBRI newsletter, AVS

Italy

23-26/02/2001	BERGAMO	**EDIL 2001** Rassegna Delle Macchine, Materiali, Attrezzature.Salone delle Tecnologie per La Ristrtturazione e Il Restauro
15-18/3/2001	BINASCO (MI)	**MILANO EDILIZIA 2001** , Salone dell'Edilizia Civile e Industriale
23-26/03/2001	ERBA	**MECI-MOSTRA EDILIZIA CIVILE E INDUSTRIALE,** Mostra edilizia civile e industriale
20-22/04/2001	TRIESTE	**EXPO DELLA BIOEDILIZIA** BIO C.A.S.A.
21-25/04/2001	BOLOGNA	**SAIEDUE** , Salone del Serramento e della Finitura
02-07/10/2001	BOLOGNA	**SIAE 2001** Salone internazionale dell'edilizia
18-22/10/2001	MILANO	**SICUREZZA 2001** Salone della sicurezza integrata
22-25/11/2001	TORINO	**RESTRUCTURA 2001** Salone della costruzione e della ristrutturazione edilizia

Japan

- S. Suzuki, Building Centre of Japan, Tokyo – expressed interest in collaborating.
- Y Yamanaka, as above

Korea

- S-E Lee, Research Institute of Industrial Science & Technology Steel Structure Research Laboratory, Hwasing Kyungkido
- W Y Kang, Kaywon School of Art & Design, Kyunggi-do

Netherlands

- K Westenoek, BAS, STABU – collaboration on thesaurus established.

New Zealand
Presentation by R Amor, CIB W78, Iceland June 2000

Presentation by R Amor, CIB Congress April 2001

Presentation by R Amor, CIB W78, South Africa June 2001

Contacts:

- Don Bunting, General Manager, Construction Information Ltd, Auckland
- Grant Williams, Sales Manager, Strategic Data, Eagle Technology Group Ltd, Auckland
- Wayne Sharman, General Manager, Science and Engineering Services, BRANZ, Porirua City

Portugal

Presentation by G Gudnasson at ECPPM, Lisbon 2000

Slovenia

Provision of information on CONNET by GCS (Building Centre of Slovenia) at MEGRA, Slovenian Construction Fair, 10-14 April 2001, Gornja Radgona

Spain

Presentation by O Rio, Seminar 5 of CEMCO Course. 23 March 2001.

Contacts:

- AMIET - Association of Members of IETcc
- M. Álvarez, Computer Science Faculty. Polytechnic University of Madrid. Attending Madrid Meeting. http://www.ls.fi.upm.es
- Dragados y Construcciones - involved in the development of a National gateway with NECSO http://www.dragados.es
- Juan M. Mieres, NECSO. Attended the Madrid Meeting. http://www.necso.es They are involved in The Build2Build company, acting as on-line "market creators" for all the agents/participants in the construction sector. Their objective is to draw together and improve all segments within the sector.
- Victor Castelo, REDIRIS. Spanish Network of RTD, http://www.rediris.es/rediris/index.en.html

Sweden

- C-E Brohn, Svenskbyggtjanst, attended Helsinki meeting, expressed interest
- M Wulff, as above

Switzerland

- Prof. Gerhard Schmitt. ETH Zürich, Switzerland. http://caad.arch.ethz.ch/~schmitt

United Kingdom

Presentation by D Bloomfield, Architects Journal conference, RIBA, London, 11 May 2000

Presentation by D Bloomfield, ARCLIB conference, Newcastle, 20 July 2000

Presentation by D Bloomfield, BRE, 30 April 2001

Article in UK electronic news service “Insight”, April 2001

Contacts:

- M Hussein and K Singh, BuildOnline, London – expressed interest and joined related EU proposal dealing with construction products service
- ConstructionPlus – reached agreement to use BRE’s Technical Publications service within their own commercial on-line services

Yugoslavia

- Z Dordevic – expressed interest in joining, attended Ljubliana meeting

Annex F – Ownership of Deliverables from CONNET/I-SEEC

This statement has been drawn up following discussions with I-SEEC participants

	IPR	USAGE
Data Models and API specifications for central services	CONNET version : 100% EU through CONNET project; I-SEEC version: new services 100% BRE; updated services 70% EU, 30% BRE through I-SEEC	Free to all, including non partners
Implemented API for central services in European Gateway (currently hosted at BRE) – passing queries between gateways, user profiling	25% CONNET through CONNET project; 75% BRE through I-SEEC project; discussion forum -100% BRE through CBPP classification manager -100% BRE through ARROW thesaurus interface used in Web Resources service - 100% BRE through ARROW WordNet used in Web Resources service - freeware from USA	Free to all CONNET and I-SEEC partners (refers to version currently in existence and to that extant on 30 April 2001) or as per the final EEIG agreement
Technical Publications: Data Code Finland Iceland Italy Netherlands Slovenia Spain UK	Data for each national system is owned by each national partner /operator/their partners BII and VTT for own systems VTT for interactions between their 22 systems IBRI UK code used TNO/BouwOnline CONNET-related code 100% IKPIR UK code used 100% BRE	Use of service free for all BRE code is free to all CONNET and I-SEEC partners (refers to version currently in existence and to that extant on 30 April 2001); VTT code to be negotiated.

	IPR	USAGE
Waste Exchange: Data Code Finland Iceland Slovenia UK	Data for each national system is owned by each national partner /operator RAKLI ry & Netspan ltd. (for Rakennusluupi) Rakennusapteeki ltd. (for Rakennusapteeki IBRI IKPIR UK DETR	 Subject to negotiation with developers
Signposts to Web resources: Data Code Finland Iceland Italy Netherlands Slovenia Spain UK	Data for each national system is owned by each national partner /operator (VTT for BuildNet, ? for Slovenia) VTT IBRI UK code used UK code used IKPIR UK code used 75% EU through CONNET, 25% BRE	Service free for all; adding data free for all UK code is free to all CONNET and I-SEEC partners (refers to version currently in existence and to that extant on 30 April 2001); VTT code to be negotiated
Calculation Software: Data Code Slovenia Programming tools & libraries	 100% IKPIR 50% EU through CONNET, 50% IKPIR 100% IKPIR	 System is free for use by all CONNET and I-SEEC partners. Subject to negotiation with developers
Who's Who Data Code Finland Iceland Italy Netherlands Slovenia Spain UK	Data for each national system is owned by each national partner /operator (BII for WW data on BRE server) BII - everything in CD IBRI BRE, uses UK code BRE CONNET-related code 100% IKPIR BRE, uses UK code 100% BRE through I-SEEC	 System is free for use by all CONNET and I-SEEC partners. Subject to negotiation with developers

	IPR	**USAGE**
Specialist Equipment and Facilities: Data Code Iceland Italy Slovenia UK	Data for each national system is owned by each national partner /operator IBRI Uses UK code CONNET-related code 100% IKPIR 100% BRE through I-SEEC	System is free for use by all CONNET and I-SEEC partners Subject to negotiation with developers
Best Practice: Data Code Finland Iceland UK Slovenia	Data for each national system is owned by each national partner /operator (VTT for Finland, Gradbeni for Slovenia) VTT IBRI DETR/CBPP IKPIR	System is free for use by all CONNET and I-SEEC partners; adding data free for Finland service Subject to negotiation with developers
Thesaurus Data Code Programming tools & libraries	Data has been provided by several I-SEEC partners who own IPR (esp. Netherlands and also Italy, Spain), and use has been made of other freely available resources 25% EU, 75% IKPIR 100% IKPIR	System is free for use by all CONNET and I-SEEC partners as follows: - to aid in searching CONNET-information services - in free-standing form for English + one national language - in free-standing form for additional languages, subject to negotiation with developers (TNO & IKPIR)
Manufactured Product Service Code Finland Iceland	Data for the Finland system is owned by BII 25% EU though CONNET, 75% BII IBRI	Subject to negotiation with developers

	IPR	USAGE
National Gateways Finland Iceland Netherland UK Slovenia Italy (as at 28/2) Spain (as at 28/2) (Germany) (Belgium) European Gateway	Code and data– VTT Code – IBRI Not developed in I-SEEC Code – BRE Code – IKPIR Code – BRE Code – BRE Code – BRE Code – BRE	Use of service is as for individual service conditions Use of code and adding new services under national gateway to be negotiated as per the final EEIG agreement Use of EU gateway by national services is free for all CONNET and I-SEEC partners; for others to be negotiated as per the EEIG agreement

Annex G – Levels of Possible Collaboration for new entrants

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.

Annex H - Glossary of abbreviations and acronyms

B	Belgium
BII	Building Information Institute, Finland
BRE	Building Research Establishment, UK
CONNET	CONstruction information service NETwork, EU project
D	Germany
Esp	Spain
Fi	Finland
GCS	Gradbeni institute ZRMK Slovenije (Building Centre of Slovenia)
IBIC	Icelandic Buiding Information Centre
IBRI	Icelandic Building Research Institute
ICITE	Istituto Centrale per l'Industrializzazione e la Tecnologia Edilizia (Central Institute for Building Industrialisation and Technology), Italy
IETcc – CSIC	Instituto de Ciencias de la Construcción Eduardo Torroja – Consejo Superior de Investigaciones Científicas, Spain
IKPIR	Institute of Structural Engineering, Earthquake Engineering and Construction IT, Slovenia
IPR	Intellectual Property Rights
IRB	Institut für Raum und Bau, Fraunhofer Gesellschaft, Germany
Is	Iceland
It	Italy
I-SEEC	Information Services To Enable European Construction Enterprises, EU project
Nl	Netherlands
Si	Slovenia
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (Netherlands Organisation for Applied Scientific Research), Netherlands
TNO Bouw	TNO Building and Construction Research, one of the Institutes with 300 plus personnel.

UK	United Kingdom
VTT	Building Technology, Finland