Helsinki Metropolia University of Applied Sciences
Degree Programme in Media Technology

Sanna Paaso

A Mapping Service for Company References

Bachelor's Thesis. 16 May 2009
Instructor: Kim Härkönen, Department Manager
Supervisor: Kari Aaltonen, Principal Lecturer
Language Advisor: Anne Perälampi, Lecturer

Metropolia University of Applied Sciences **Abstract**

Author	Sanna Paaso
Title	A Mapping Service Product for Company References
Number of Pages	50
Date	16 May 2009
Degree Programme	Media Technology
Degree	Bachelor of Engineering
Instructor	Kim Härkönen, Department Manager
Supervisor	Kari Aaltonen, Principal Lecturer

The purpose of this final year project was to show Pöyry company references on an online map and to have references easily accessible. Being able to view references on a map illustrates their global nature and reference lists and project sheets are essential in the marketing and sales process. A pilot of the service product was created for Pöyry Renewable Energy business area.

Reference projects have information such as title, country, start and end year, project type, and technical data. The project was realized by having the reference information stored and managed in Microsoft SharePoint lists and showing the references on Google Maps. The reference information is read as XML and then parsed with C# to HTML and JavaScript to create the map view and the reference sheets.

The final product shows reference projects on a map as markers; each marker opens an info window containing basic information of the project and project sheets in multiple languages can be opened from the info window.

Feedback of the pilot has been positive and it has generated many development ideas. The product at the end of this final year project is functional but some improvement in the user experience is being further developed.

Keywords	references, SharePoint, Google Maps

Metropolia Ammattikorkeakoulu Insinöörityön tiivistelmä

Tekijä	Sanna Paaso
Otsikko	Palvelutuote yritysreferenssien näyttämiseen kartalla
Sivumäärä	50 sivua
Aika	16.5.2008
Koulutusohjelma	Mediatekniikka
Tutkinto	Insinööri (AMK)
Ohjaaja	osastopäällikkö Kim Härkönen
Ohjaava opettaja	yliopettaja Kari Aaltonen

Insinöörityön tarkoituksena oli näyttää sisäisesti konsernin referenssiprojekteja kartalla ja hallita referenssitietoa. Projekteja haluttiin näyttää kartalla, jotta voitaisiin visuaalisesti havainnollistaa konsernin globaalia toimintaa. Referenssitietojen on tärkeää olla helposti saatavilla, sillä ne ovat tärkeässä roolissa myynti- ja markkinointiprosessissa. Tarjouksiin tarvitaan usein liitteeksi referenssiprojekteja näyttämään yrityksen osaaminen alalta.

Yrityksillä on käytössä referenssilistoja ja referenssiprojektikortteja. Niitä tutkimalla tärkeimpien tietojen todettiin olevan projektin nimi, maa, aloitus- ja päätösvuosi, projektin tyyppi, kuvaukset ja tekninen informaatio. Useissa tapauksissa samasta projektista huomattiin löytyvän projektikortteja monella eri kielellä. Monikielisyyttä tukemaan luotiin väliotsikot projektikortteja varten niissä eniten esiintyvillä kielillä.

Insinöörityössä toteutettiin projektien tallennus ja hallinnointi sisällönhallintajärjestelmällä. Järjestelmästä tiedot tulostetaan dynaamisesti XML-muotoon, josta ne parsitaan näytettäväksi kartalla. Projektin alkuvaiheessa käytettiin karttasovellusta, joka toimii työpöydällä mutta projektin edessä siirryttiin selainkäyttöiseen karttasovellukseen. Sisällönhallintajärjestelmä helpottaa tuotteen käyttöä valmiin käyttöliittymän ansiosta, ja projekteja on mahdollista lisätä, muokata ja poistaa hyvin vaivattomasti. Samaa sisällönhallintajärjestelmää käytetään konsernissa verkkoportaalien tuottamiseen.

Lopullisessa tuotteessa referenssiprojektit näytetään kartalla virtuaalisilla nuppineuloilla. Nuppineulat itsessään eivät näytä mitään muuta tietoa kuin projektin sijainnin, mutta niistä voidaan avata kartalle näytettäväksi projektin nimi, ajankohta, projektityyppi ja lista projektiin liittyvistä projektikorteista. Yhteen projektiin voi liittää monella eri kielellä tehtyjä projektikortteja.

Tuotteen todettiin tukevan toimialojen välistä yhteistyötä, joka on tämänhetkisessä maailmantalouden tilanteessa erittäin tärkeää myynnin lisäämiseksi. Projekti keskittyi loppujen lopuksi alkuperäisen ajatuksen eli projektien kartalla näyttämisen sijaan ennemminkin projektitietokannan toteuttamiseen.

Hakusanat	yritysreferenssit, SharePoint, Google Maps

Contents

Abbreviations

Active Directory (AD)	A component of Microsoft Windows Server used for directory services and authentication.
Application Programming Interface (API)	An interface enabling programming additional elements to existing applications and systems.
Asynchronous JavaScript and XML (AJAX)	A combination of programming languages intended for creating faster and more user-friendly web applications.
Cascading Style Sheet (CSS)	Defines how to display HTML elements.
Content Management System (CMS)	A system used to manage digital media and text usually online.
Dynamic-link Library (DLL)	A shared library concept.
Extensible Markup Language (XML)	An extensible language designed to share structured data especially online.
Geographic Information Systems (GIS)	An information system dedicated to handle information which is linked to its location.
Global Positioning System (GPS)	A global satellite navigation system.
Google Maps	A web browser based map service.
GUID	A unique identifier for a SharePoint list.
Hypertext Transfer Protocol (HTTP)	An application-level protocol to transfer information between a client and a server.
Hypertext Transfer Protocol Secure (HTTPS)	A secured version of HTTP.
Hypertext Markup Language (HTML)	A markup language for web pages.
Internet Information Services (IIS)	A collection of server services from Microsoft.

Internet Media Type (MIME type)	Guides the Internet browser how to handle files.
International Organization for Standardization (ISO)	An international organization setting standards.
JavaScript	A client side scripting language.
Keyhole Markup Language (KML)	An XML-based file format for displaying data on maps.
KMZ	A compressed KML file.
Hypertext Preprocessor (PHP)	A server-side scripting language.
Portable Document Format (PDF)	A file format for storing documents.
Pöyry Personal Portal (P3)	A global intranet intended for all Pöyry employees.
SharePoint	Microsoft’s content management system.
Structured Query Language (SQL)	A language for retrieving and managing data in relational databases.
Three-dimensional (3D)	Mathematical representation of a three-dimensional object.
Typo 3	A content management system written in PHP.
Uniform Resource Locator (URL)	Defines a protocol used to retrieve information from given location.

1 Introduction

The aim of this final year project was to create a service product to show Pöyry company reference projects on a virtual map. The product enables Pöyry employees to access reference project information internally. A pilot of the product was created with Pöyry Renewable Energy business area and their reference projects.

Pöyry as a group has over 100 000 reference projects and so far there has not been a common way of creating or storing reference project sheets [1,9]. Different Pöyry companies, business areas, or business groups have had their own way of managing reference project information. It is important to have the reference information available because the references play a significant role in the marketing and sales process. This product enables accessing references easily and efficiently.

In the product reference information is stored, viewed, and updated in Microsoft SharePoint. Reference information can be viewed and sorted in SharePoint lists and references can be shown on Google Maps which is an online map service. SharePoint has been used as a collaboration platform at Pöyry since 2007.

Viewing reference projects on a map supports the Global Network Company concept Pöyry follows. By having the references scattered on a map, the product shows how truly global the company is.

This thesis covers parsing information from SharePoint web portal, displaying it on Google Maps, and creating reference project sheets.

2 Theoretical Background

2.1 Pöyry Group and Organization

Pöyry is a global expert in consulting and engineering and has annually more than 15 000 projects. It consists of five business groups which are Energy, Forest Industry, Transportation, Water & Environment, and Construction Services. Business groups are divided into 21 different business areas. [2]

The purpose of the project was to create a pilot of the reference project database for a business area. Later on that pilot can be used as a template for other business areas or business groups as well. It was decided not to create one single database for all of Pöyry's references because it would not be feasible and easily maintained due to the vast amount of projects.

Lifecycle approach makes Pöyry unique in its way of operating. Services may cover everything from strategy and planning to operations including industry and strategic development insight, development and project management, and implementation and local services. A close client relationship during every investment and project phase is important to have the correct understanding and approach. [1,5]

People as individuals in Pöyry belong to business units. Business areas and business units share the same human resource, legal, information technology, and marketing departments and office buildings. Pöyry invests in sharing all know-how, internal research and development which are available to all Pöyry units for free. [3,7-8]

Pöyry focuses on generating success for its clients. Pöyry's values state that the best solutions come from competent people, working together in teams and sharing knowledge. Client, team, drive, and excellence sum up Pöyry's values. The delivery promise consists of competence, service and solutions which are illustrated on the outer cycle of figure 1.

Figure 1. Cycle of success [3,15]

Knowledge, expertise and reliability enable clients' success. The cycle of success is an expression that captures Pöyry's delivery promise and values. A long-lasting, mutually rewarding and self-regenerating alliance with clients is created by focusing on competence, service and solutions. The outer cycle is supported by Pöyry's values which form the inner circle in figure 1. Working according to the cycle delivers excellence as an outcome for clients and Pöyry employees. [4,15]

There are over 10 million euros annually invested in developing business models and methods. Hundreds of software, project and document management, integrated engineering, reporting and follow-up tools have been developed internally. Applications available to support work include e-Learning environment, document management, web-surveys, collaboration and communication platforms, and CAD conversions. In addition there are also thousands of commercial applications in use which enables Pöyry's personnel to work with the programs their clients desire. [3,12]

Using a common IT platform enables global co-operation. Nearly 200 offices around the world are connected to each other and share the basic tools; computers run Microsoft Windows operating systems and Microsoft Office desktop applications, Lotus Notes databases and e-mail services. Expenses are cut by making vast global deals with suppliers

such as Adobe, Autodesk, Microsoft, and Hewlett-Packard. Some 3 million euros are spent on internal application development each year. [3,13]

Pöyry Application Services Oy focuses on providing application development and other types of business solutions mostly internally for other Pöyry companies but if needed also for external clients. Application development includes creating new stand alone applications, integrating existing systems, and producing SharePoint services. Application development can be based on system's own tools or some other tools as well. Java and .Net technologies are used for web development. [5;6]

2.2 Global Network Company Concept

Pöyry operates in 49 countries all over the world. To streamline its operations, Pöyry has a group wide strategy process. Each employee shares the same values and objectives in addition to each company sharing common operating models. Pöyry's brand, mission and vision support versatile operations. [3,15]

The single-brand concept "One name. One brand. One vision." was launched in March 2006. Previously Pöyry had companies operating under various names, for example former Electrowatt-Ekono Ltd is now named Pöyry Energy Ltd. according to the single-brand strategy. The single-brand allows the Pöyry group to operate under a unified brand and visual identity. The new Pöyry logo shown in figure 2 was also published in 2006.

Figure 2. Pöyry logo

The three aims of the single-brand strategy are to strengthen the global network company strategy, to unite the efforts to gain more strength, and to build brand equity into one brand. [7;8]

The internal and external websites were renewed. Pöyry launched the new external www.poyry.com in November 2008. It present Pöyry's services and offering from the customer's point of view [9]. One of the future development possibilities is to have some, if not all, references available on the global web site.

The roll out of Pöyry's new intranet Pöyry Personal Portal (P3) started in February 2008 and is estimated to end in mid-2009. The target of P3 is to setup one global intranet for all Pöyry employees to support the global network company concept and daily work. P3 takes advantage of existing information sources; it does not itself contain information but creates one common interface for multiple information sources. Contents can be external or internal for example from Lotus Notes databases or Microsoft SharePoint portals. One of the near future goals is to create an interface to show the reference projects from SharePoint in P3. [10]

"Our brand is defined, not by words and images alone, but by the sum of the brand experiences it generates." states the internal one brand brochure [11]. A shared resource of reference projects supports the strong global image. By having the vast amount of reference projects that Pöyry has scattered on a map, it is visually impressive and the global nature of the projects is a lot easier to understand.

Pöyry's strategy is to offer a broad variety of services under the same Pöyry brand regardless of geographical location or business unit. The target is to have small local offices offering the services of the whole group: local presence – global resources. It allows Pöyry to offer services to both globally and locally operating client companies. [3,9]

Integrated use of resources is the main foundation of a Global Network Company. The aim is to have various Pöyry companies working in the same office and for everyone to have access to the common tools. Managers can get the best personnel across company boundaries for the current project and therefore achieve better results. Pöyry strongly

supports sharing knowledge and knowledge management is developed so that each person can access the needed information. Sharing knowledge does not just gather existing information but also creates new knowledge and innovations. Pöyry has a vast capital in its personnel and their knowledge. [4,5-8]

One important resource is references; having a shared database of references improves cross-selling. Even though reference projects' information would be located on business area or group based different SharePoint sites, all of the information would be available to every employee. For example if a person is meeting a client and the client has heard of a project the Pöyry employee does not know of, he can just search for the reference project immediately or find the project for the next meeting and thus avoid an unpleasant situation. He does not need to know who worked on the project and figure out a contact person to find the information, only the field of the project and the location or the period of time.

2.3 Marketing and Sales Process at Pöyry

Pöyry has references from over 100 000 projects. In the previous situation, there was no unified way of creating project sheets, updating, or storing them. They were in different formats such as Word documents or in Portable Document Format (PDF) as well as had very different layouts. The main users of the product will be salesmen, consults and line management. In most situations they are the people who need to find references most efficiently.

Marketing and communications advisor in Pöyry Infra Oy, the marketing and sales process usually begins by meeting a potential client at a fair or the client finding Pöyry online. The next step for Pöyry is to set up a meeting with the client. The first meeting is usually about hearing the client's needs and defining the services which could be useful for the client and giving a general introduction to Pöyry. The second meeting goes deeper into what Pöyry can offer to the client. As the meetings move ahead, the scope of work becomes clearer. After the first meetings the client makes an invitation to submit a tender and Pöyry has to response with one. If everything goes smoothly, the deal can then be closed and project

work starts. [Antti Nykänen, Marketing and Communications Advisor, 17 March 2009, personal communication]

According to Mr. Nykänen references play an important role in the marketing and sales process. They can be present already in the first two phases, first contact and first meeting, but their importance in the second meeting and in the tender is far greater. References in the second meeting proof that Pöyry has experience of the same field or the country the client is planning its project in. A list of similar projects is sometimes enough but having project sheets of each project gives a better impression, delivers more specific information, and visualizes the project effectively.

The nature of a tender can vary a lot as Mr. Nykänen describes. The most detailed ones are usually demanded by the public sector since they always have to treat each tenderer equally. The public sector gives points to each tender in pricing and in quality. Quality points are partially given according to the delivered references and that is why it is very important to present the most corresponding references.

An important feature of a reference database is that it is easily searchable and that referenced can be filtered. In the previous situation the Renewable Energy business area project sheets were quite spread around, some of them could have been found in the Renewable Energy intranet and some only as printouts in local offices. In the Lotus Notes intranet the references were saved as PDFs and Word documents divided into categories by project type. Most of the original work files were not available so no changes could have been made.

Another example besides Renewable Energy is Transportation business group whose digital references are still only in Lotus Notes intranet. They are all shown in one single view and are grouped by the first letter of a country as shown in figure 3.

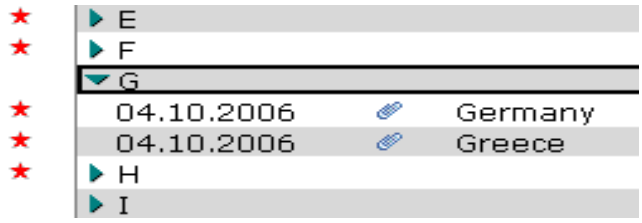


Figure 3. Transportation references in Notes database

To see the references in the selected country, the name of the country has to be clicked and then another view opens showing all of the PDF documents as shown in figure 4.

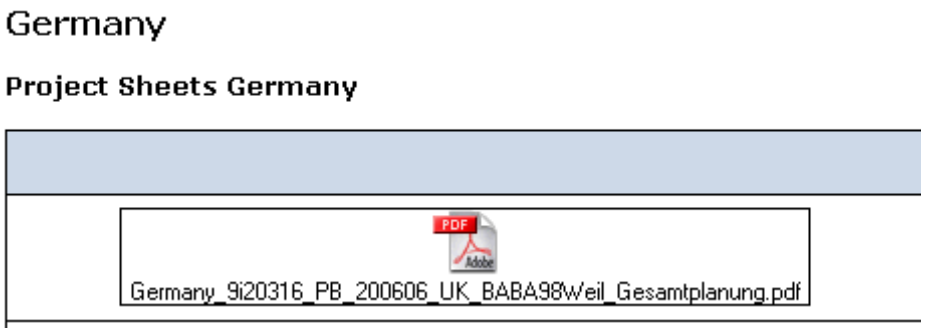


Figure 4. Transportation PDF document in Notes database

The only visible information of the project has to be placed in the file name. To get any additional information of the project, the PDF document has to be opened. Finding a reference with corresponding information takes a lot of time. Grouping the projects by country or by project type has been a quick fix for the problem but not the kind that would really ease the process of finding the correct references.

The challenge salesmen face every time they are looking for references for a tender is finding the best references available quickly. The previous way was to ask around, call people, and browse the PDF documents. With deadlines closing in, salesmen sometimes are forced to settle with what they can find immediately.

Sometimes a client can define the type of criteria strictly; for example they can not be older than 5 years and they have to be situated in the same country. In that case searching and filtering come in as remarkably important features.

Project reference sheets should follow a constant visual appearance. If the references do not look alike it reduced the impression of Pöyry as a single-brand company. In the product project reference sheets are created with basic elements shown in appendix 2. They are generated as Hypertext Markup Language (HTML) pages with the option to print out. The basic HTML project sheet consists of a title, a map, a picture, and information of the project in addition to the Pöyry logos.

2.4 Geographic Information System

Geographic Information System (GIS) is used for storing, managing, and displaying geospatial data. Geospatial data is information which is linked to its location and thus it is natural to show the information on a map. 60-80% out of all of the information in the world can be linked to a location [12,29]. Geospatial technology is listed as one of the three major emerging industries in the United States in 2006. [13,1]

GIS differs from other information systems by being able to handle and process geospatial data. It enables layering and combining geographical information sources such as maps, aerial images and statistics.

Geospatial data consist of two components: spatial data and attribute data. Spatial data represents the location whereas attribute data represents the characteristics. In an object based data model spatial data is stored along with other attributes. [13,5-8] One of the main aims of this project was to add spatial data to the attribute data which in other words means adding location to the rest of the reference project information.

The spatial data is defined with x and y coordinates which in this project are longitude and latitude that are most commonly used coordinates when talking about location. The

attribute data includes for example project name, country, city, customer, and project details. References are represented using position-based representation as points. [14,176] These points are called markers in Google Maps.

Google Maps is an online map application. It can be used for finding locations, businesses, and it provides directions between two or more places. Optional ways of viewing the map are map, satellite, and terrain views. With the free application programming interface (API) that Google offers, it is possible for users to create their own Google Maps mashups to show additional contents and tailor it to one's needs. The map data used is provided by Tele Atlas.

Combined with global positioning systems (GPS), remote sensing, and mobile devices GIS has enabled advanced location-based services, interactive mapping and in-vehicle navigation systems. GPS is currently the most used satellite navigation system. As the amount of GPS devices increases, it makes GIS more and more interesting by having an easy way to add location to other information such as photographs.

Pöyry Environment Oy has a department of geographical information services. The department helps customers to collect, organize and manage their geographical information and to develop their geographical information systems so that they support the client's business operations. [15]

To have more freedom with the maps used for showing references, Pöyry's maps could have been used. Pöyry Environment Oy uses ArcGIS server which also supports showing 3D models they way Google Earth does. Google Maps and Google Earth are used in the project because they were already chosen for the project in the previous attempt to show Pöyry reference projects on a map.

One of the advantages of showing references on a map is that they are visually appealing. It is more interesting to look at a map which can be zoomed and moved instead of a list of

text. Filters are of course available for lists to show for example only projects in Switzerland but filtering the data like that might miss references in places close-by but across the border of the country.

In the project only markers are used for showing locations of projects. The markers are placed on the map with single longitude and latitude coordinates. Additionally, GIS allows information to be shown as a segment of a line, a line or as a polygon [16]. Lines could be used for example to visualize a tunnel or a railroad on a map whereas polygons could be used to show a plant area or an airport.

2.5 Stages of the Project

The project was started for the first time in 2006 by another final year student. In the beginning the purpose of the project was only to view three-dimensional (3D) models in Google Earth which is a virtual map application. It combines aerial photography, satellite images, and geographic information systems. The maps are laid on a 3D ball to create a globe and the viewing distance and angle can easily be changed. In 2006 Google Earth was still quite new and exciting and one of the reasons to use it was to be able to follow the new technology.

The earlier project was based on Typo3 and PHP which were running on a separate an Apache server. The server's only purpose was to host the product so maintaining it was up to the person who had installed it and maintenance was inadequate.

The earlier project was left unfinished but the issue of managing and viewing reference projects and their 3D models was raised up again in the summer of 2008. Because the person working on the project was no longer working for Pöyry and the project was not documented, it would have been difficult to finish his work. A decision to change the platform was made because the solutions used were quite restricted and did not support the Global Network Company concept. SharePoint was chosen for the project instead of Typo3 since it is much better supported at Pöyry and the servers are well maintained. Even though

SharePoint is not as easily customized as ordinary databases, SharePoint lists are much easier to update and control since the user interface is ready-made.

When redesigning the whole product, it was decided to use Google Maps in addition to Google Earth because it works in an Internet browser so the user would be able to see the projects on a map without having to install any additional software on his computer. Google Maps still could not have fully replaced Google Earth because Google Maps was not able to show the 3D models.

The main idea was to show project information in SharePoint and to have a link to open the project 3D model in Google Earth. In that solution each project would have its own SharePoint site with a related documents document library, image gallery and a Google Maps view of the location as shown in appendix 1. There were only a few projects with Google Earth compatible 3D models so having a new SharePoint site for each project would have not been an issue. Having separate sites also had some benefits as managing user rights; when each project was on its on site, the user rights were easy to give on project-specific base.

The 3D model based reference database was put aside for a while when a new need for online reference database emerged. There was a need to move all of the Renewable Energy's references from their Notes database into their new SharePoint intranet. They were keen on the idea of being able to show the references on map to visualize how global their business truly is. Altogether there were approximately 180 project references with some of them having project sheets in two or more languages. It was no longer possible to have a new SharePoint site for each project.

The way to show a project location as a marker on Google Maps with information dynamically coming from SharePoint was already created within the framework of the 3D model reference database. The coordinates were typed into a SharePoint list and then used to place the marker. By the means of being able to process coordinate information from

SharePoint it was quite fast to develop a method to show other information on Google Maps as well.

In the previous version the reference navigation was in Google Earth but it was created for only a few projects and was not very user friendly when used with hundreds of projects.

The two projects were then combined. Besides showing basic information of a reference project, links to open attached files were added. The attachments could have been in any file format like documents or pictures but 3D models as well. Google Maps was, and still is not, able to show the 3D models so clicking the link would have opened Google Earth and showed the 3D model. A link to open a view as shown on Google Maps was generated to show the same project information in Google Earth as shown in figure 5.

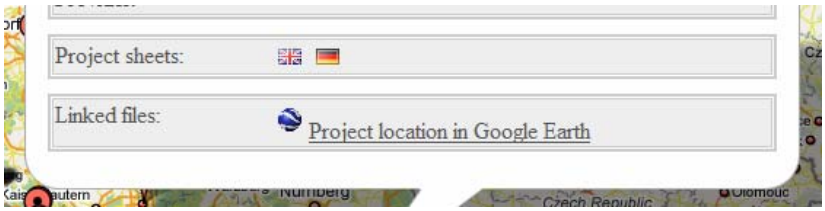


Figure 5. A link to view project in Google Earth

Due to shortage of Google Earth compatible 3D models and no need for other attachments, the linked files section was removed. Without the 3D models, being able to view the same information on Google Earth did not bring any added value. The possibility to show linked files was kept for the prospect of a later need.

2.6 Visualization at Pöyry

Pöyry uses Google Earth for planning the plots and plant areas whereas previously aerial photos where used. Aerial photos are still used for visualization if available, if not then the visualization team uses Google Earth. Visualization also takes advantage of the contour maps in Google Earth which can be used as textures in a visualization program. Models look more realistic when a satellite or aerial image map is used for surroundings.

Some of the visualization applications can create a Google Earth compatible Keyhole Markup Language (KMZ) files. However the reason why there are not that many KMZ 3D models yet is that the creation is still quite a troublesome process. As soon as the process becomes easier and faster, creating one will most likely become part of the visualizing workflow. The advantage of a 3D model in KMZ format is Google Earth having a limited free version, whereupon it would be possible for customers without visualization tools and the application licenses to view the 3D models. Some free 3D model viewers do exist but they only show the model, not the surroundings.

In the beginning of 2009 Google is publishing Google Earth 5 which can also show maps from different times. It allows users to travel back in time and study earlier stages of any place. [17] That could also enable viewing different stages of a 3D model, for example how a production plant is built. Google Earth shows 3D buildings in some of the major cities and is planning on showing more and more of them.

According to the original plan to show references which have 3D models of them the KMZ files were shown as linked files and could have been opened from Google Maps. Clicking a link launched Google Earth. If the link was clicked on a computer where Google Earth was not installed, there was an option to save the file for later viewing. Optionally, a link to view the project information in Google Earth could have been clicked.

Clicking the “Project location in Google Earth” link opened a KML file which was generated with ASP code on the fly. Google Earth showed the exact same information of the opened project as was shown in Google Maps. Google Earth did not show any other project but the one in whose info window the link was clicked.

Keyhole Markup Language (KML) is an extended version of Extensible Markup Language (XML). It focuses on geographic visualizations [18]. KML has a set of predefined nodes which are used with Google Earth, Maps, and Mobile or any other geobrowser supporting

KML. Each Placemark is defined in the structure inside a `<Placemark>` node. Placemarks can have elements such as name, description, and coordinates. KMZ files are compressed KML files. [19]

When Google Earth is installed, it sets itself as the default program for KML and KMZ files. For Pöyry's SharePoint servers to support KML and KMZ files, their Internet Media Type (MIME) had to be added to the Internet Information Services (IIS). The function of the MIME types is to tell a web browser how to handle files received from a server. Without the MIME types set, files would have to be saved locally and then opened. [20]

3 Realization of the Reference Publishing Tool

3.1 Reference Information

Reference information was collected from existing project sheets. Because of lacking a common standard, the outlook and content varied from sheet to sheet. Many of the existing project sheets were examined to find the connective items. Although many of the project sheets share basic titles like name, start and end year, city, and country even they were not constant in all of the project sheets. Some were simply just missing information and some projects were still ongoing, located across the country (like roads and railways) or in multiple countries at the same time.

The rest of the information was even more complex. As the people producing the project sheets had free hands, the titles of technical information and project descriptions were almost always different. In the end, the titles summing up the projects were Short and long description, Services, Technical data, Process and plant, and Special features.

Information was also given in several languages. The issue was solved by creating two lists, the first one to hold numeral and location information and the second to hold all language relevant information. Another option would have been to create one single list with the language relevant fields multiplied by the number of languages desired or having a new item for each project sheet in a different language. That would have resulted in having the same information saved over and over again and adding extra load onto the server. Also if some information would have changed, it would have had to be updated in multiple items.

The project sheets can not be opened from the SharePoint lists but only from the info windows shown on Google Maps. Figure 6 shows how in the product the project sheets can be opened in different languages by clicking a flag image describing the language the project sheet is written in.

Figure 6. Project sheets in multiple languages

The flags illustrating a project sheet language are stored in a document library called “Flags”. The link where the flag points to is parsed as follows.

```
String data = "<a href=\"" + baseurl + "XMLs/kml.aspx?id=" +
owner_projectid;
data += "&info=" + infoid + "&output=html\" target=\"new_page\">";
data += "<img src=\"" + baseurl + "Flags/" + language + ".gif\"/></a>";
```

The link directs to the kml.aspx file which is given the project and project info ids to show the correct information. The output is set to HTML which tells the kml.aspx file to generate a new HTML page with the given project information. Because each project’s information in different language is stored as a separate item in the project info list so the language can be determined by knowing the project’s info id.

Creating a project sheet from the existing information was not originally in the plan. It got developed as a by-product. When showing the information of a project, it was noticed that since the information shown is same than in the project sheets, it could also look like a project sheet. The outlook of a HTML file can easily be changed and when designing the layout, the project sheets ended up looking like the printed out project sheets.

If generating project sheets had been included in the plans already from the beginning, that part of the project could have been designated some more time. With more time the project sheets could have been generated as PDFs instead of HTML files and thus be more easily saved and printed. The problem of printing out HTML files is that by default background pictures, like the Pöyry logo in this case, are not printed and the printout have a header and a footer with print date and address of the HTML page.

The visual look of the info windows is created with HTML and Cascading Style Sheet (CSS). Different CSS style sheets are used to create a info window, a project sheet, and for printing out a project sheet. When printing out project sheets, the same style sheet is used as the one used for displaying project sheet on screen, the only additional element is `input { display : none; }` which hides the “Print project sheets” and “Close window” buttons on top of the project sheet.

3.2 Google Maps

To be able to use Google Maps, JavaScript has to be enabled in the web browser. Google Maps supports the following web browsers: Microsoft Internet Explorer 6.0+, Mozilla Firefox 2.0+, Apple Safari 3.1+ and Google Chrome (21). By default, Google Maps uses UTF-8 character encoding [22].

In the project Pöyry’s references are placed on Google Maps as markers. They are clickable and each one opens an info window as shown in figure 7.

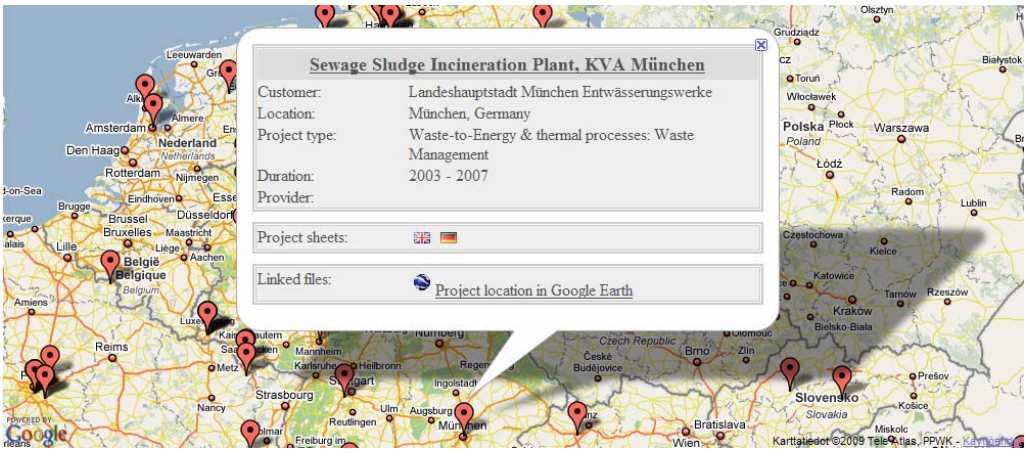


Figure 7. Reference markers and an open info window on Google Maps

An info window shows basic information of the project in the first section of the box. From the middle section, project sheets can be opened. Language flags are fetched based on the language defined in ProjectInfo list.

Additional files were linked to reference projects and showed in the last section. A KML file was generated so that the reference could have been viewed in Google Earth as well. Due to the changed nature of the project, the last section was removed.

Besides using Google Maps for placing references on it, it is also used in the reference sheets to view a small map having only one marker as shown in figure 8. The map on reference sheets is frozen so that it can not be moved or zoomed and the marker is not clickable.

Figure 8. Smaller map used on reference sheets

Through Google Maps Application programming interface, a selected view can be saved as a picture. That option could have been used in the HTML project sheet since no functionality is needed. Having the map as a picture would also help with printing because now when the map is printed, the shadow of the marker is printed out quite blurry due to transparency. The possibility was unfortunately found out after finishing the product and had to left for later development.

The picture in the figure 6 on the right side of the map is fetched from the item attachments. It is resized with JavaScript to have the same maximum height and width as the map. The aspect ratio is kept the same and no cropping occurs which means that the picture can be

less either in width or height than the map. If multiple pictures are attached to the project list item, the picture in the project sheet can be switched by clicking the picture.

The logic behind showing and swapping a picture is that all of the pictures are named consistently as Picture1.jpg, Picture2.jpg and so on. The assumption is that Picture1.jpg is shown and when the picture is clicked and the next picture is shown. As soon as the JavaScript switching pictures generates an error by trying to show a picture which does not exist, Picture1.jpg is shown again.

Google states in its terms and conditions that maps can be printed out as long as the amount does not exceed 5000 and maps are not used as essential part of the print out (such as printed maps or guide books)[23]. In the first phases of the project the limit of 5000 is not an issue since the project sheets are not optimized for printing. As soon as a way to generate project sheets as PDFs is created and printing them is part of a workflow, the issue has to be discussed with Google.

The link to open project information in Google Earth was generated with the opened info window's project id (id) and project info id (info). Output parameter was set to KML; the parameter is just another variable among other variables and does not have functionality as a parameter but the functions are defined for the variable.

```
<a href=\"" + baseurl + "XMLs/kml.aspx?id=" + id + "&info=" + info +
"&output=kml\">Open project in Google Earth</a>
```

The code above generates a link such as the following.

```
https://hub.poyry.com/asfi/project/Pilot/34T0044/XMLs/kml.aspx?id=31&info
=53&output=kml
```

When the link was clicked, C# code would check the ids and output method and run the following code.

```
if (output == "kml") {
Page.Response.ContentType="application/vnd.google-earth.kml+xml";
Page.Response.AppendHeader("Content-Disposition", "filename=\"" +
project_name + ".kml\"");
Page.Response.Write("<kml xmlns=\"http://earth.google.com/kml/2.2\">\n");
…
}
```

When output is set to KML the page content type is set so that it tells the browser to call Google Earth to open the file.

3.2.1 Dynamic Maps

Google Maps has two application programming interfaces (APIs); one is based on JavaScript and the other one on Flash. This thesis focuses on the JavaScript version. API as a tem refers to enabling programming additional elements on top of another program without having to know that much about how the program itself works. Usually application programming interfaces are made public to have more people working on them and thus get new and interesting applications [24,10]. The full Google Maps can be embedded on an external web site by using the Google Maps API.

To be able to use the Google Maps API, an API key must be acquired. Each domain which has the Google Maps integrated needs its own key. A Google Account is needed for retrieving the key from Google web site. When signing up for the key, the user agrees on the Google Maps API terms and conditions. The key is put into the JavaScript code. [22]

JavaScript is a client-side scripting language powerful in creating dynamic web applications. It is often used to add interactivity to a web site. The code itself can be put into a HTML file or used as an external JavaScript file. It is mostly used for handling input fields, creating cookies, and online applications. [24,6] In this project JavaScript code is

used to add markers and lay other additional information on top of the map. JavaScript is also used to initialize the map.

JavaScript is used in Asynchronous JavaScript and XML (AJAX) to send and receive data between the Internet browser and the server. Traditionally every time something new is loaded on a web page, the whole page needs to be reloaded but with AJAX it is possible to update only predefined parts of the page. That translates to faster page loading since not everything needs to be reloaded. Google Maps, GMail, and Flickr started the AJAX hype in 2006. [24,8-9]

In addition to using JavaScript with the application programming interface, Google Maps also uses JavaScript extensively in showing the maps. As the user moves the map or zooms in or out, new segments of the map are loaded. During loading, the new segments are seen as grey boxes. Thanks to advanced use of JavaScript, the entire page is not loaded every time a new segment is loaded.

JavaScript is used to initialize the map. When output parameter of a link clicked is set to “maps” an HTML page with Google Maps and project markers is created. The map is initialized to the size of 1000 pixels times 800 pixels. Map controls are laid on the map and then scroll wheel zoom and markers are enabled. Then all of the projects are looped through and laid on the map as markers as shown in figure 9.

Figure 9. Reference project markers on Google Maps

Navigation tools to move the map and zoom in or out are placed on the left side and the option to change the view is placed on the right side.

3.3 SharePoint

Microsoft SharePoint is a Content Management System (CMS) used at Pöyry Application Services to create portals, called hubs, for projects.

SharePoint combines the following technologies:

- ASP.NET (including Web Parts)
- Internet Information Services (IIS)
- Active Directory (AD)
- SQL Server

SharePoint enables effective online collaboration. Hubs are user-friendly web sites created to support networking. Web sites can consist of announcements, contact lists, calendars, shared documents, links to related information, discussions, and wiki pages. [25]

As hubs work with a secure connection (HTTPS), each time Google Maps is viewed there, a security warning box appears as shown in figure 10.

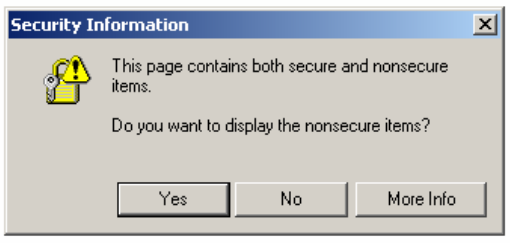


Figure 10. Warning box

A typical user will not know why the box is shown and might click No in which case the maps would not be shown on the page. Google Maps has recently released Google Maps

API Premier which provides secure maps over HTTPS. It also fastens the render time of the maps and is valuable for high traffic websites and data intensive batch processes. [26]

3.4 Hub Components

Main component of SharePoint sites are web part pages for the content and navigation tools such as top link bar and quick launch menu to navigate on the hub. As the name top link bar refers, it is a navigation bar in the upper part of the site as shown in figure 11.

Figure 11. Top link bar

This project was part of a bigger project to create an intranet site originally for Renewable Energy and then later on for Renewable Energy and Power&Heat business areas. There is a link to their references in the top link bar. Throughout the Renewable and Power&Heat hub the top link bar stays the same to keep the navigation constant.

The quick launch navigation is used for navigation within the different sections, sites, in SharePoint. One of the sites in the Renewable Energy and Power&Heat hub is references whose Quick Launch menu is shown in figure 12.

Figure 12. Quick launch navigation

The first link “All Projects” lists all of the basic information of projects and the second link “ProjectInfo” lists more detailed information of the projects.

The main content of the site is shown under the top link bar and on the right side of the quick launch menu. The most common way to display information is to show it on a web part page. In the example on figure 13 there is a two column web part page.

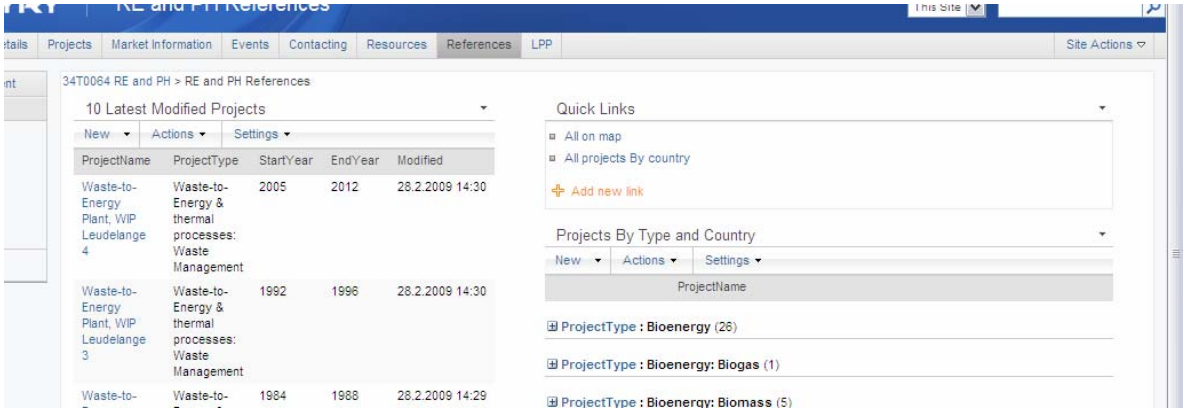


Figure 13. Web part page

10 latest modified projects are shown on the left column. The view is of the All Projects list sorted in descending order by the modified column and items are limited to 10. On the right hand side column on top there is a Quick Links section which is a link list containing two

links. The first link show all projects on Google Maps and the second list shows the All Projects list items grouped by country and sorted in an ascending order. The lower web part shows All Projects list items grouped by project type.

3.4.1 Lists

All the information of references is stored in SharePoint lists; they are a user interface for storing data in an SQL database. Lists are fundamentally like any other tables of data. The basic knowledge of databases and their relations helps to understand these lists' functions. On the other hand, if a person is only adding or updating information, lists are easy to use. SharePoint has a variety of lists out of a box but the most useful in this project are the custom lists.

Lists consist of rows and columns sort of like Microsoft Office Excel spreadsheet program. Columns can store different data types, for example single or multiple lines of text, numbers, date and time fields, hyperlinks and pictures, or choices of given values. More advanced types are lookup and calculated. With a lookup field, a column from another list can be brought into another one. In general, lookups can be used to avoid having to type in the same data over and over again. Formulas can be created in the calculated field to show information based on other fields. [27,318-322]

Reference information is stored in two custom lists called Project and ProjectInfo. Project list contains all the information of the project which is not language relevant or has to be a choice of predefined values. Project list is shown in figure 14.

Project

New Actions Settings View: All Items

ID	Edit	ProjectName	ProjectType	StartYear	EndYear	Customer	City	Country	Office	Latitude	Longitude
3		A.T. Biopower Power Plant	Bioenergy	2003	2005	A.T. Biopower Co., Ltd.	Pichit Province	Thailand	Pöyry Energy Ltd, Thailand, Renewable	17.390419	104.788971
4		Biomass Power Plant Delitzsch	Bioenergy: Biomass	2003	2004	Bauunternehmung Beck GmbH & Co. KG	Delitzsch	Germany	Pöyry Energy GmbH, Renewable	51.521957	12.337282
5		Biomass Power Plant EAM Borken	Bioenergy: Biomass	2001	2002	EAM Energie-Aktiengesellschaft	Borken	Germany		51.844167	6.855058
6		Biomass Power Plant CFB Königswusterhausen	Bioenergy: Biomass	2001	2003	Foster-Wheeler Energie OY	Königs Wusterhausen	Germany		52.298916	13.627807
7		Biomass Power Plant Menteroda	Bioenergy: Biomass	2001	2002	Plambeck Neue Energien AG	Menteroda	Germany		51.308519	10.558977
8		Biomass Power Plant Pietarsaari	Bioenergy: Biomass	1996	2001	Alhomens Kraft Ab Oy	Pietarsaari	Finland		63.674666	22.703661

Figure 14. Project list

ProjectType is a choice column and the rest, StartYear, EndYear, Customer, City, Country, Latitude, and Longitude, are single line of text fields. The Office column is a lookup to another list called Offices; the column is kept for possible later use but is not used in the project.

Most of the columns in ProjectInfo list are shown in figure 15.

ProjectInfo

New Actions Settings View: All Items

ID	Title	Language	Project Short Descprition	Services	Technical Data	Project
4	A.T. Biopower Power Plant	English	20 MW rice husk-fuelled power plants, located at Pichit Province	Turnkey contractor providing the following EPC services: • Overall Project Management • Detailed design: boiler plant (in association with McBurney), Balance of plant, electrical installations, civil works • Process engineering and technical integration • Civil, structural and architectural works • Procurement of all mechanical equipment, entire electrical system, instrumentation and control system • Erection and installation, commissioning and performance testing of the complete power plant		A.T. Biopower Power Plant
5	Biomass Power Plant Delitzsch	English	Installation according to European Energy Law Capacity: 20 MWe	• Preparation and participation to award contracts of building services • Construction design and design engineering, civil engineering and building services • Engineering design infrastructure • Site supervision for building services • Escape route maps	• Biomass input: 18 Mg/h • Thermal capacity: 69 MWth • Steam generation Steam parameter: 72 bar/450 °C • Power generator: 20 MWe	Biomass Power Plant Delitzsch
6	Biomasse-Kraftwerk Delitzsch	German	Neuinstallation nach EEG Leistung: 20 MWe	• Vorbereiten und Mitwirken bei der Vergabe Gebäudetechnik • Ausführungsplanung Bau- und Gebäudetechnik • Ausführungsplanung Infrastruktur • Örtliche Bauüberwachung Gebäudetechnik • Flucht- und Rettungswegpläne	• Biomasse Holzinput: 18 Mg/h • Feuerungswärmleistung: 69 MWth • Dampferzeugung Dampfparameter: 72 bar/450 °C • Turbogenerator: 20 MWe	Biomass Power Plant Delitzsch
7	Biomass Power Plant EAM	English	New installation of a biomass	• Project management	• Biomass input: 14 Mg/h	Biomass Power Plant EAM

Figure 15. ProjectInfo list

ProjectInfo list contains a language column where the used language is chosen. Language column type is choice and the optional languages are predefined. Project column is a lookup field linked to the Project list Title field. Other columns are Project Short Description, Project Long Description, Services, Technical Data, Process and Plant, and Special Features whose column type is multiple lines of text. With the multiple lines type of text column text can be formatted as plain text, rich text, or enhanced rich text.

XML is a language designed to hold information. Information is stored in nodes which can have attributes to describe the given information or optionally all of the information can be given as attributes. [28] SharePoint lists can be viewed as XML. All of the information typed in columns is then shown as node attributes. C# is used in this project to parse the XML.

SharePoint has a Dynamic-link Library (DLL) file owssvr.dll which provides different method calls. It can be used for example to request a XML schema for a web site. It also provides a way to view lists as XML. The Uniform Resource Locator (URL) commands use HTTP GET requests to get XML results from the server. If altering the content database was needed, HTTP POST could be used but because only viewing the database is required, HTTP GET works for that purpose. [27,659;29,316]

By default all items are viewed but by changing the unique identifier (GUID) of a list in the URL, different views created for the list can also viewed as XML (29,317). There is no simple method to get the list GUID from the list name but it can be manually extracted from the URL when viewing a list. Another option is to filter the list by giving the URL parameters and values. [27] Viewing list information in XML format happens by typing the lists address in the following format:

```
https://hub.poyry.com/asfi/project/Pilot/34T0044/_vti_bin/owssvr.dll?Cmd=
Display&List=eddda413%2D2ecc%2D45c4%2Daa6c%2Da162faad71a8&XMLDATA=TRUE
```

As a result project information is given in the following XML format.

```
<z:row ows_Attachments="1" ows_ID="178" ows_LinkTitle="Usine
d'incinération de déchets urbains Thurgovie, Suisse"
ows_ProjectType="Wind power & other renewable energy: Waste heat and
district heating" ows_StartYear="1990" ows_EndYear="1997"
ows_Customer="Verband KVA Thurgau (association de 80 communes du canton
de Thurgovie) Weinfelden, Suisse" ows_City="Thurgovie"
ows_Country="Switzerland" ows_Office="0;#" ows_Longitude="47.535596"
ows_Latitude="9.14004" />
```

The shown XML is parsed and the information is saved into variables and then used to lay information on Google Maps and to create project sheets. Because information is located in two list items in separate list, there is a variable used to connect the correct list items.

3.4.2 Libraries

Document management in SharePoint is based on libraries which are much like Windows folders. A document library can be opened in an Explorer View so that it actually looks and behaves like a local folder. SharePoint offers a variety of different libraries, such as document, form, picture, and wiki page libraries. [29,114]

All of the libraries used in the project are basic document libraries which are general-purpose libraries for managing different file formats. A document library called XMLs is used to hold .aspx, CSS, and HTML files. They are all files which basic users do not need to access so the library is not shown in any menus; if access to it is needed, it can be done from the “View All Site Content” link.

Libraries are quite similar to lists by having columns, views, settings, and permissions, just like lists do. A library is kind of like a list where each item has one and only one attachment. The main difference is that library items have versioning and folder structures.

Security settings for a library are automatically inherited from the parent site but each library, folder and item can optionally have separate permissions. [30,211-212]

Within this project, libraries are not used very actively but only to store code and the flag images. In the earlier stages of this project, a document library was used for storing the attached files.

3.4.3 User Authentication

Windows Active Directory is a central directory service. A directory service can be used for example to create phone books or library databases. At Pöyry AD is used to manage Windows-based user accounts, clients, servers, and applications. Directory services differ from relational databases by being optimized for searching information where relational databases are optimized for relational transactions. In Active Directory elements of a network (such as users and computers) are organized into a hierarchical structure. A top-level container is called forest which can contain one or more domains. [31;32]

Active Directory is the foundation for SharePoint for authenticating users [27,37]. Existing user groups from Active Directories can be used in SharePoint which enables efficient user rights assignment. SharePoint also supports other directory services but Active Directory was already in use at Pöyry so it was a natural choice when the SharePoint server was installed in 2006. Active Directory and SharePoint are both Microsoft products so integrating those goes quite smoothly.

In the current situation SharePoint is installed on pg1.poyry.com domain which trusts some of the other domains, for example Finnish (fi.poyry.com) and German (de.poyry.com) domains. Domains are named using 2-character country codes established under (ISO) 3166 of the International Organization of Standardization as shown in figure 16.

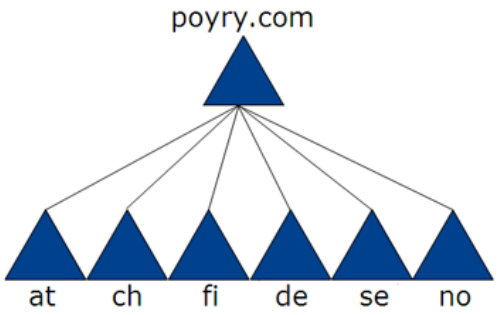


Figure 16. Current trusted Pöyry domains

A trust relationship enables user authentication in SharePoint and therefore users in domains not trusted by pg1.poyry.com can not log in to hubs. Users are authenticated in the same place where the domain is located which means that it can take place in a distant location and therefore be slow. There are no technical barriers to create a trust relationship with other countries as well but some other issues do exist like for example few countries have multiple Active Directories instead of having just one. The more scattered the directories are, the harder it is to control what kind of users exist in them.

The current setup enables shared use of resources only between each country and the poyry.com domain. It does not automatically create a relationship between different countries but the trusted relationship has to be manually created which is not practical since in the end there would be an uncontrollable amount of trust relationships.

Pöyry's target is one.poyry.com, a single forest model which would enable common global catalog for all users and automatic trusts between all domains. In the model all of the users would be located in one.poyry.com domain which other Pöyry domains would trust. Resources would be located in local domains to enable local administration of personal computers and local servers. User information would be centralized and easily manageable.

Pöyry grows mostly by acquiring new companies. The one.poyry.com model would help integrating IT systems efficiently with the newly gained companies. Adding users to the

domain would be a fast process which would grant new employees access to shared Pöyry resources. It is important to be able to start working effectively as soon as possible. The slower part of the process would be integrating the new company's resources to Pöyry's resources but in the beginning the new employees could use their old resources with their previous usernames and the new Pöyry resources with their new Pöyry usernames. As soon as the resources would be fully integrated, the old usernames could be deleted from their local domain.

The challenge of keeping information up-to-date partly remains the same even with one.poyry.com. So far it has not been decided which party would be the one making sure that every person leaving Pöyry would also be deleted from the directory. On the other hand, once that is solved the directory is better supervised compared to having multiple directories.

In the current situation when a user is logged into a Pöyry computer which is in any of the trusted domains, he will not have to log into a hub since he is automatically authenticated. When the person is using his personal computer he will log into a hub with the same username and password he uses to log in to his Pöyry computer.

User rights in SharePoint can be granted and modified by local administrator. Permissions groups are divided in three: site owners, members and visitors. By default owners have full control of the site, members can edit, add, and delete content and visitors have read-only access. To give more unique rights, new groups can be created or the existing groups' permissions can be edited. Users who do not have permission to for example certain lists, will not see them in the top link bar or quick launch navigation. [27,270]

3.4.4 Server Side Coding in SharePoint

By default files in a SharePoint document library are not allowed to execute server side coding. An error message is shown if trying to do so: *An error occurred during the processing of kml.aspx. Code blocks are not allowed in this file.* To be able to use C# in an

.aspx file, it needs to be defined as safe in the SharePoint web configuration. The `AllowServerSideScript` needs to be set to true. [33]

```
<PageParserPaths>
        <PageParserPath VirtualPath="/pages/*" CompilationMode="Always"
AllowServerSideScript="true" IncludeSubFolders="true"/>
</PageParserPaths>
```

By default `<PageParserPaths>` does not contain anything. When marking a file safe, it is better to give a direct path to the file as opposed to allowing server side scripting for all files in a specific folder. That way it is far more controlled that which files can execute code. It is important to control who can modify the files which are marked as safe, otherwise they could be misused to execute something unwanted.

In the code, variables are used so that the product is easy to implement on another SharePoint site. For example all of the links used are defined in the beginning of the file as variable.

```
String baseurl = "https://hub.poyry.com/asfi/project/Pilot/34T0044/";
String projectkey = "eddda413%2D2ecc%2D45c4%2Daa6c%2Da162faad71a8";
```

Later on in the code, the links can be referred to with the variables.

```
String projecturl = baseurl + "_vti_bin/owssvr.dll?Cmd=Display&List=" +
projectkey + "&XMLDATA=TRUE";
```

Network credentials are used to have access to the needed information. A generic maps.asfi@hub user was created for that purpose and was granted reader rights for the used lists. The username and password can be acquired from the code which is accessible by anyone so it is really important not to grant the generic user any more extensive user rights.

4 Evaluation

4.1 Results

The product succeeds in being able to visualize the global nature of Pöyry reference projects. Even by having the references only from one business area, they cover the map extensively and generate a feeling of plenty of experience in different areas of the world.

Because the product was originally designed for showing project references on a map, viewing reference sheets is only possible by first finding the project on the map and then opening the project sheets. As the product turned into more of an online database for project references, it would have been useful to be able to open the project sheet straight from SharePoint list item.

In the last few days of writing this thesis, a way to show information from two lists, Project and ProjectInfo, was developed. From that view it is also possible to open the project sheets in HTML format. The view is shown in figure 17.

Joined project and projectinfo

ProjectName	ProjectType	StartYear	EndYear	ID	Project	Language	Project Sheet
A.T. Biopower Power Plant	Bioenergy	2003	2005	3	A.T. Biopower Power Plant	English	Project Sheet
Biomass Power Plant Delitzsch	Bioenergy: Biomass	2003	2004	4	Biomass Power Plant Delitzsch	English	Project Sheet
					Biomass Power Plant Delitzsch	German	Project Sheet
Biomass Power Plant EAM Borken	Bioenergy: Biomass	2001	2002	5	Biomass Power Plant EAM Borken	English	Project Sheet
					Biomass Power Plant EAM Borken	German	Project Sheet
Biomass Power Plant CFB Königswusterhausen	Bioenergy: Biomass	2001	2003	6	Biomass Power Plant CFB Königswusterhausen	English	Project Sheet
					Biomass Power Plant CFB Königswusterhausen	German	Project Sheet

Figure 17. A joined view for showing the references

The project sheet in a desired language can be opened from the link “Project Sheet”. Project sheet information can be edited by clicking the project name on the left side of the language, the link directs to the current item in ProjectInfo list. The view was created with SharePoint Designer by using a joined sub view. The method can be further studied from http://office.microsoft.com/en-us/sharepointdesigner/HA100991441033.aspx.

4.2 Future Development

A near future development prospect is generating PDFs out of the information located in SharePoint lists but it was not implemented in this final year project since it was not included in the project definition. Originally even generating project reference sheets in HTML format was not included.

When HTML project sheets are printed out date and source information is automatically added to the print out and the background image (Pöyry logo) is left out which are not desired features. By generating PDFs instead of HTML pages both of the problems would be solved and also saving the project sheets locally and attaching them to e-mails would be easier.

The layout of the project reference sheets in general apart from the format have much room to improve. Now the layout of the text fields is static and if a field is left empty in the ProjectInfo list, it results in an empty area in the project sheet. A solution to divide text into three columns is something to be developed. The problem is how to divide text and not to break sentences in wrong places.

In their SharePoint hubs Pöyry uses List Search Webpart Advanced Search created by Bamboo. Advanced search enables efficient search within lists and it can handle very complex search criteria as figure 18 shows.

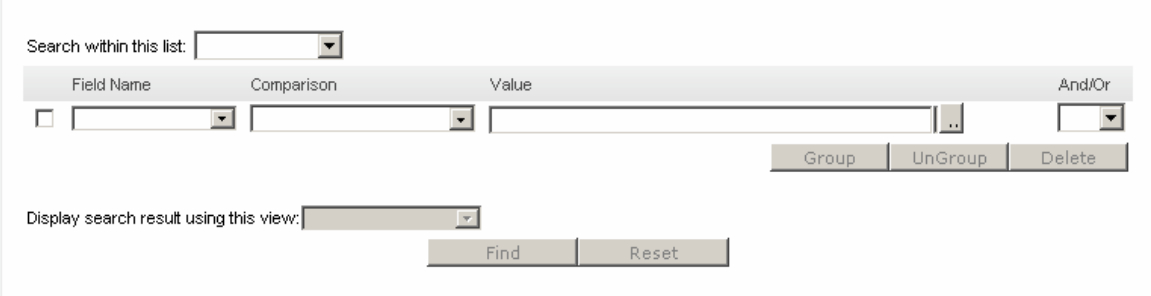


Figure 18. Advanced search by Bamboo

For example if looking for a project carried out in Germany between 2003 and 2005 with a project type of bioenergy a logical search as shown in table 1 could be used.

Table 1. Complex search criteria

Field Name	**Comparison**	**Value**	**And/Or**
Country	equal to	Germany	And
StartYear	equal or greater than	2003	And
EndYear	equal or less than	2005	And
ProjectType	equal to	Bioenergy	

The advanced search could be implemented on the reference hub. It functions better than filtering a list since filtering only gives an option to match a value exactly, filtering does not support greater or less than –options.

As discussed before, the product could be incorporated into Pöyry P3 intranet. Figure 19 shows a possible solution to view the product through an iframe. iFrame is kind of a window showing content from other web sites.

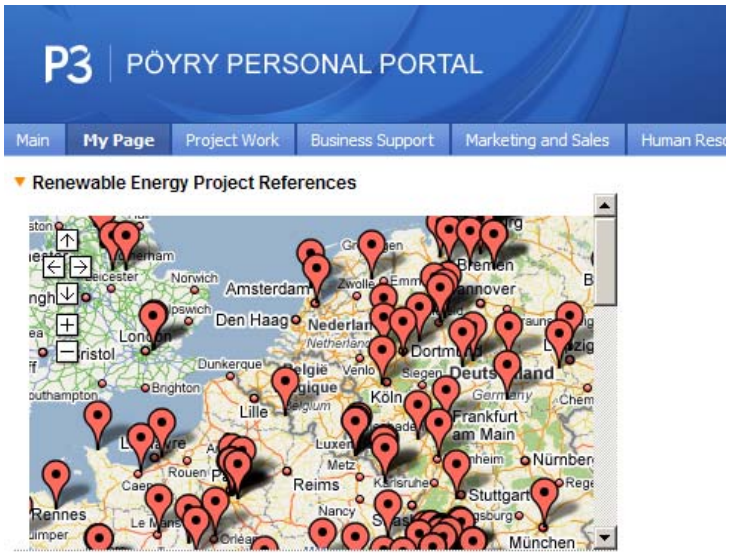


Figure 19. Mock up of the P3 incorporation

The product would need a view designed for the iframe. In width an iframe is a third of the web browser it is viewed in so width is dynamic which requires the product to be scalable as well. The info window which opens from a marker should contain less information to have it fit into the iframe.

At the moment if multiple markers are placed on exactly same coordinates, it is impossible to see both of the markers. The only way to be aware of that is to notice that the shadow behind a marker is darker if there is more than a single marker on the same spot. One solution to that is creating an automatic workflow to SharePoint to check the coordinates every time a new item is created. Another solution is to compare the coordinates when laying the markers on map and shift them a bit so that they are not on top of each other. The third fix is to use one of the solutions Google has created like tabbed info windows.

The usability of adding new projects to the database could be improved. In the current situation user has to first create the project in Project list and then create multiple instances in the ProjectInfo list if the project has information in different languages. Each time a new item is created into the ProjectInfo list, it needs to be connected to the correct project in the

Project list. To increase the usability adding a new project would happen by filling in just one form. For example after filling in the basic information of the project into the Project list, a button could be pressed to show more fields for additional languages. Information would still be stored in separate lists but the user would not notice that.

Possible addition to the project is connecting it with PARM which would enable adding more information to projects. PARM is a project accounting and risk management system. It is the most widely used application in Pöyry since it enables salary payment. Each project is listed in PARM so it would be possible to get for example details of the client, people working on the project, and working periods added to reference sheets.

People who have worked on the project could have their CVs added to the project information. If the product would also generate CVs then if a person has been marked as having worked on the project, the product could add the project information to the person's CV.

GPS information could be used to locate projects and people. Information could be collected for example from project manager's mobile phone to get the exact location of the project. If instead of single point markers lines and polygons were used, would they be drawn based on a few different spots the project manager has saved the coordinates from.

Another possibility for the future is to have all of the references publicly on Pöyry website. The issue with showing them publicly is that some of the information is sensitive and another one is that Pöyry's SharePoint requires users to log in.

5 Conclusions

The goal of this final year project was visualize Pöyry reference projects by showing them on a map. The project information is stored in Microsoft SharePoint and shown on Google Maps. The further development of the product should focus more on the usability to ease the process of adding new projects and the way the project sheets are generated. The method of showing projects on Google Maps could possibly be changed so that no web configuration is needed for the implementation.

In general the issue of handling reference project information is strongly present across business areas in Pöyry. In the current state of the world economic situation, anything that improves selling can be seen as highly significant. As soon as one.poyry.com has been realized and every Pöyry employee can have access to SharePoint hubs, the product can be fully implemented. By having the reference information available regardless of business group or area boundaries, cross-selling can become more efficient.

References

1 Linna K. Company presentation 2009 [PDF document]. Vantaa, Finland: Pöyry PLC; 11 March 2009.

2 Pöyry PLC [online]. Business structure. Vantaa, Finland: Pöyry PLC; 24 March 2009.
URL: http://www.poyry.com/group/group_4_1.html. Accesses 28 March 2009

3 Salminen T. Pöyry IT meeting 2008 [PowerPoint presentation]. Vantaa, Finland: Pöyry PLC; 15 September 2008.

4 Pöyry PLC. Brand book. Vantaa, Finland: Pöyry PLC.

5 Olkkonen M. Pöyry Application Services: Yritysesittely [PowerPoint presentation]. Vantaa, Finland: Pöyry Application Services Oy; 8 May 2007.

6 Syrjänen T. Application development: IT Week presentation 2008 [PowerPoint presentation]. Vantaa, Finland: Pöyry Application Services Oy; September 2008.

7 Bobst K. Clientletter 04/06 [PDF document]. Zurich, Switzerland: Pöyry Energy; 20 April 2006.

8 Pöyry Global Communications Team. Communication info newsletter 10/07 [PDF document]. Pöyry Group; 16 October 2007.

9 Pöyry Global Communication Team. Communication info newsletter 03/08 [PDF document]. Pöyry Group; 4 March 2008

10 Barck M, Syrjänen T. P3 introduction IT 2008 [PowerPoint presentation]. Pöyry Application Services Oy; 16 September 2008.

11 Pöyry Group. Join our cycle of success: One Name. One Brand. One vision. [PDF document] Pöyry Group; 27 February 2006.

12 Fabritius H, Kenno P, Nowak A. Lukion Maantiede Aluetutkimus. Keuruu, Finland: Kustannusosakeyhtiö Otava; 2006.

13 Chang KT. Introduction to Geographic Information Systems. 4th ed. Singapore, Singapore: McGraw-Hill companies; 2008.

14 Harvey F. A Prime of GIS: fundamental geographic and cartographic concepts. New York, United States: The Guilford Press; 2008.

15 Pöyry Environment Oy. Paikkatietopalvelut (GIS) [online]. Vantaa, Finland: Pöyry Environment Oy; 5 February 2009.
URL: http://www.environment.poyry.fi/tuotteet/tuotteet_3.html. Accessed 12 March 2009.

16 Google. Map overlays [online]. Google; 2009.
URL: http://code.google.com/intl/fi-FI/apis/maps/documentation/overlays.html. Accessed 28 February 2009.

17 Google. Google Earth: Explore, Search and Discover. New! in earth 5.0 (beta) [online]. Google; 2009.
URL: http://earth.google.com/tour.html#v=1. Accessed 15 March 2009.

18 Open Geospatial Consortium Inc. KML [online]. Open Geospatial Consortium Inc; 1 April 2009.
URL: http://www.opengeospatial.org/standards/kml/. Accessed 1 April 2009.

19 Google Code. KML Tutorial [online]. Google; 2009.
URL: http://code.google.com/apis/kml/documentation/kml_tut.html. Accessed 20 February 2009.

20 Microsoft TechNet. Working with MIME Types (IIS 6.0) [online]. Microsoft Corporation; 2009.
URL: http://www.microsoft.com/technet/prodtechnol/WindowsServer2003/Library/IIS/eb5556e2-f6e1-4871-b9ca-b8cf6f9c8134.mspx?mfr=true. Accessed 1 April 09.

21 Google. Google Maps Help: System requirements [online]. Google; 2009.
URL: http://local.google.com/support/bin/answer.py?answer=16532&topic=1499. Accessed 4 April 09.

22 Google Code. Google Maps API Concepts [online]. Google; 2009.
URL: http://code.google.com/intl/fi-FI/apis/maps/documentation/. Accessed 11 April 2009.

23 Google Code. Google Maps/Google Earth APIs Terms of Service [online]. Google; 2009.
URL: http://code.google.com/intl/fi-FI/apis/maps/terms.html. Accessed 28 February 2009.

24 Smith D, Negrino T. JavaScript – Tehokas hallinta. 1st ed. Jyväskylä, Finland, Gummerus Kirjapaino Oy; 2007.

25 Poole M. SharePoint Designer Tutorial – Working with SharePoint Websites. Birmingham, UK: Packt Publishing; 2008.

26 Google. Google Maps API Premier [online]. Google; 2009. URL: http://www.google.com/enterprise/maps/. Accessed 28 April 2009

27 Pyles J, Buechler C, Fox B, Gordon M, Lotter M, Medero J, Mehta N, Poelmans J, Pragash C, Prussak P, Regan Ch. SharePoint 2007 The definitive Guide. 1st ed. Sebastolpol, CA: O'Reilly Media Inc; 2007.

28 W3C. Extensible Markup Language (XML) [online]. W3C; 5 April 2009. URL: http://www.w3.org/XML/. Accessed 7 April 2009.

29 Webb J. Essential SharePoint 2007. 2nd ed. Sebastopol, CA: O'Reilly Media Inc; 2007.

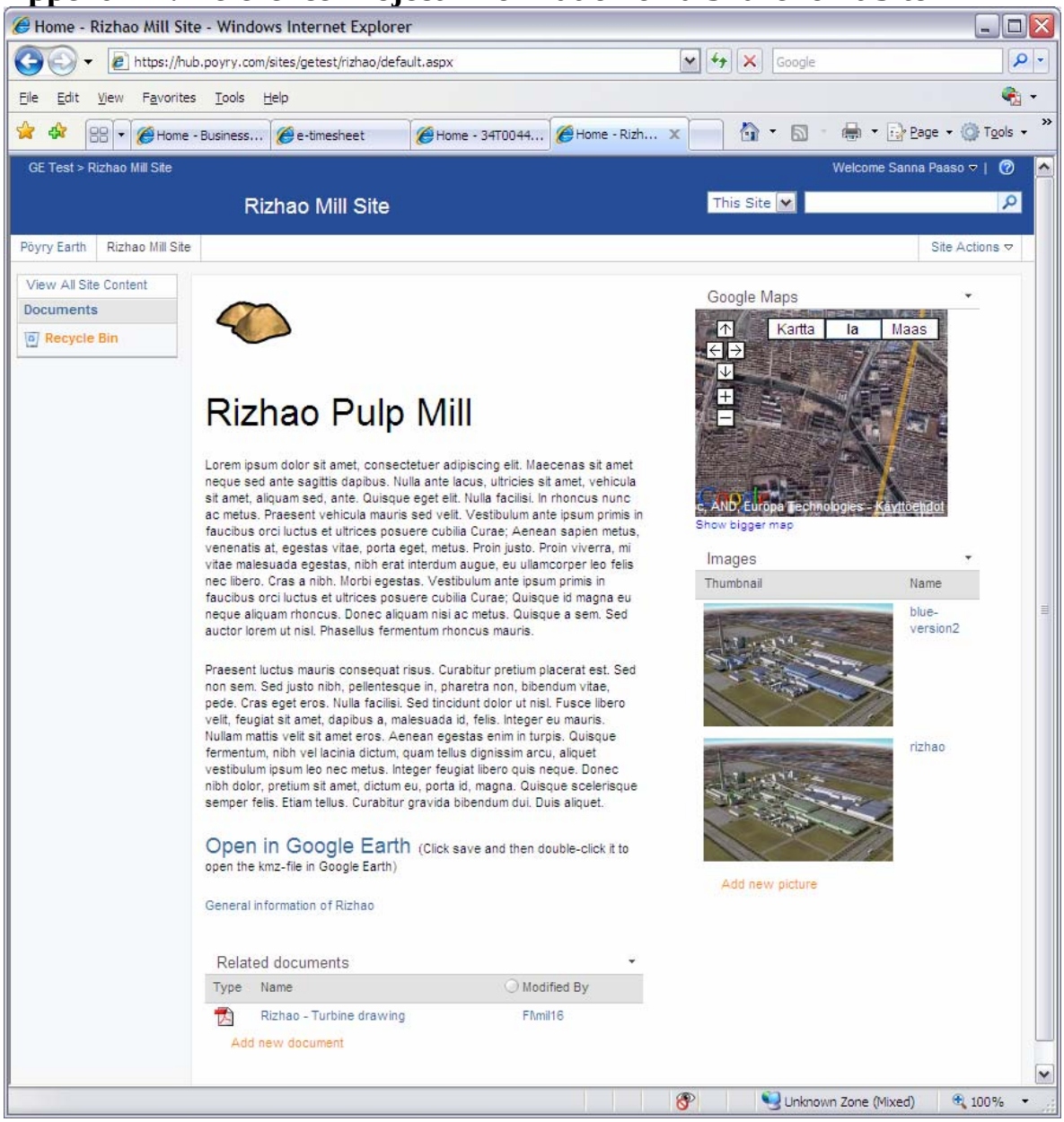
30 Bates S, Smith T. SharePoint 2007 User's Guide: Learning Microsoft's Collaboration and Productivity Platform. New York, United States, Apress; 2007.

31 Dias J. A Guide to Microsoft Active Directory (AD) design [online]. Livermore, CA: Lawrence Livermore National Laboratory; May 2002. URL: http://www.doecirc.energy.gov/ciac/documents/ MS_Active_Directory_Design_Guide.pdf. Accessed 16 March 2009.

32 Microsoft TechNet. Creating and Enhancing Security Boundaries [online]. Microsoft; 28 March 2003. URL: http://technet.microsoft.com/en-us/library/cc780326.aspx. Accessed 16 March 2009.

33 Microsoft Developer Network (msdn). Inline Code [online]. Microsoft; 2009. URL: http://msdn.microsoft.com/en-us/library/bb862025.aspx Accessed 25 February 2009.

Appendix 1: Reference Project Information on a SharePoint Site



Appendix 2: An HTML Project Reference Sheet