Project No. 249024

NETMAR

Open service network for marine environmental data

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	Coordinator: Prof. Stein Sandven Nansen Environmental and Remote Sensing Center Thormøhlensgate 47, Bergen, Norway Tel.: +47 55 20 58 00 Fax. +47 55 20 58 01 E-mail: stein.sandven@nersc.no

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Consortium

The NETMAR Consortium is comprised of:

- Nansen Environmental and Remote Sensing Center (NERSC), Norway (coordinator).
  Project Coordinator: Prof. Stein Sandven (stein.sandven@nersc.no)
  Deputy Coordinator: Dr. Torill Hamre (torill.hamre@nersc.no)
  Quality Control Manager: Mr. Lasse H. Pettersson (lasse.pettersson@nersc.no)
- British Oceanographic Data Centre (BODC), National Environment Research Council, United Kingdom
  Contact: Dr. Roy Lowry (rkl@bodc.ac.uk)
- Centre de documentation de recherche et d'expérimentations sur les pollutions accidentelles des eaux (Cedre), France.
  Contact: Mr. François Parthiot (Francois.Parthiot@cedre.fr)
- Coastal and Marine Resources Centre (CMRC), University College Cork, National University of Ireland, Cork, Ireland.
  Contact: Mr. Declan Dunne (d.dunne@ucc.ie)
- Plymouth Marine Laboratory (PML), United Kingdom.
  Contact: Mr. Steve Groom (sbg@pml.ac.uk)
- Institut français de recherche pour l'exploitation de la mer (Ifremer), France.
  Contact: Mr. Mickael Treguer (mickael.treguer@ifremer.fr)
- Norwegian Meteorological Institute (METNO), Norway.
  Contact: Mr. Øystein Torget (oysteint@met.no)

Author(s)

- Øystein Torget (oystein.torget@met.no)
- Torill Hamre (torill.hamre@nersc.no)
- Declan Dunne (d.dunne@ucc.ie)
- Mickael Treguer (mickael.treguer@ifremer.fr)
- Vincent Gouriou (vincent.gouriou@cedre.fr)
- Mike Grant (mggr@pml.ac.uk)
- Pete Walker (petwa@pml.ac.uk)
- François Parthiot (Francois.Parthiot@cedre.fr)

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Executive Summary

NETMAR has developed a pilot European Marine Information System (EUMIS) for searching, downloading and integrating satellite, in situ and model data from ocean and coastal areas. It is a user-configurable system offering flexible service discovery, access and chaining facilities using OGC, OPeNDAP and W3C standards. It uses a semantic framework coupled with ontologies for identifying and accessing data from distributed sources, including near-real time, forecast and historical data. EUMIS enables further processing of such data to generate composite products and statistics suitable for decision- making in different marine application domains. NETMAR consist of 4 different pilot implementations each demonstrating different aspects of EUMIS:

- Pilot 1: Arctic Sea Ice and Met-ocean Observing System
- Pilot 2: Oil spill drift forecast and Shoreline Cleanup assessment services in France
- Pilot 3: Ocean Colour – Marine Ecosystem, Research and Monitoring.
- Pilot 4: The International Coastal Atlas Network (ICAN)

As part of the NETMAR project two test phases have been planned and performed. In this report the feedback from the testing of the final version of the EUMIS portal is reported, summarised and evaluated.

More than 40 people have participated in the testing of the EUMIS portal either through formal testing using predefined scenarios, user interviews and demonstrations and in larger workshops. The feedback from the testing has been recorded both in portal evaluation questionnaires for the more formal testing and in test reports.

Both the qualitative and quantitative feedback from the testing has been categorised and summarised. The main conclusions from the testing are that

- The users like the concepts (service chaining, semantic search and display of different types of data from different providers) that are demonstrated by the EUMIS portal.
- There has been a significant increase in the user satisfaction with the portal compared to the first test phase. This is most likely due to the fact that the portal is now complete and contains improved implementations of the portal components and more data.
- There are still some bugs in the implementation and the users also reported a number of usability issues.
- There was need for more documentation and training material in how to use the portal.

Overall the feedback has been positive and any further development of the portal components should focus improved usability coupled with good training material in the form of online help tools, more cookbooks and video demonstrations.

Contents

1 Introduction

1.1 Background

NETMAR has developed a pilot European Marine Information System (EUMIS) for searching, downloading and integrating satellite, in situ and model data from ocean and coastal areas. It is a user-configurable system offering flexible service discovery, access and chaining facilities using OGC, OPeNDAP and W3C standards. It uses a semantic framework coupled with ontologies for identifying and accessing data from distributed sources, including near-real time, forecast and historical data. EUMIS enables further processing of such data to generate composite products and statistics suitable for decision- making in different marine application domains. NETMAR consist of 4 different pilot implementations each demonstrating different aspects of EUMIS:

- Pilot 1: Arctic Sea Ice and Met-ocean Observing System
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- Pilot 3: Ocean Colour – Marine Ecosystem, Research and Monitoring.
- Pilot 4: The International Coastal Atlas Network (ICAN)

To gather feedback to the EUMIS portal from the user communities two test phases have been defined. To facilitate the testing a set of concrete use cases specifying how the user will carry out a specific operation to solve their real-world tasks has been defined for each pilot. An example of such a use case is making a comparison between satellite and in situ time series data in order to verify common parameters or to show correlations between different ones. Each use case will need data delivery and/or processing services to provide the information needed by the user, and will use the tools and framework developed by NETMAR. Some of the use cases may also use services and software components provided by other GMES projects and initiatives, provided that these are publicly available.

To record the feedback received from the user community a portal evaluation questionnaire has been used together with less formalised test reports. By using a combined approach with a formal questionnaire and less formal written report, a large spectrum of different feedback can be reported and be used in the evaluation of the portal.

1.2 Objective of this report

Report user feedback from test on the final version of the EUMIS portal, evaluate the final version of the EUMIS portal and provide suggestions for future improvements of the EUMIS portal.

1.3 Terminology

Think aloud protocol – Think aloud protocol is a protocol used to gather data in usability testing in product design and development.

NVS – Nerc Vocabulary Server

1.4 Organisation of this report

Chapter 2 gives an overview of the test methodology that has been used. Chapter 3 reports on the testing that has been done and categorises the feedback from the portal evaluation questionnaires and test reports. Chapter 4 evaluates the EUMIS portal while Chapter 5 provides some overall conclusions.

2 Methodology for testing and evaluation

The desired functionality of the EUMIS portal has been defined in cooperation with users as a set of use cases with accompanying text describing important operations for the targeted user communities [TOR+13]. In addition to the use cases, which are at a high level of abstraction, a set of concrete checklists or scenarios have been defined to guide the testing of the system. While a use case might say that a user should be able to search for data in the discovery client, the scenario will say exactly how it should be done, what the user should search for and describe the response from the system where it is relevant. In addition to guiding the test users through the system, the scenarios also provides checklists to see that the system provides the functionality as expected.

In addition to success/fail feedback for each step in the scenarios an evaluation questionnaire was designed to enable capture of feedback for all pilots in a consistent and comprehensive manner. This evaluation questionnaire collects information about:

- What functionality is most important for the user
- How is the user satisfied by the implementation of the EUMIS portal and services
- What parameters are of interest to the user
- Is the provided information relevant and sufficient
- Is the provided data quality information sufficient
- Usability issues for the portal
- Suggestions for improvements of the portal (e.g. add information or improve functionality)
- Experiences from using the portal

The evaluation questionnaire has been used for all user testing and can be found in Appendix A. Analysis of the questionnaire can be found in section 13.2.

2.1 Test methodology

The test methodology emphasises direct contact with users through interviews, demonstration, dedicated meetings or workshops. During these events, new features will be demonstrated and discussed, and the service or portal providing partner(s) will present the latest results from NETMAR as well as informally interview the users about their experiences and assessment of the developments so far. Some of the questions asked during these meetings will originate from the evaluation questionnaire, but will typically be more open ended to allow users to communicate their needs as well as their impression of the developed services and portal more freely. This informal interview technique combined with filling in the structured evaluation questionnaire was chosen because it was a practical technique that all service providing partners could carry out without further training in more formal techniques. Also for a prototype system like EUMIS it is important to have close contact with the user during testing. In a prototype system minor problems can make it harder for the user to achieve and end goal and without proper guidance it can lead to unnecessary problems and too much focus on usability issues rather than the bigger picture of the usefulness of the principles behind the portal. This does of course does not imply that usability issues are not important to solve in the end, just that the focus should be in the demonstration of the underlying principles and technologies.

In addition to the more informal test techniques using scenarios and interviews some partners experimented with a formal methodology, called the think aloud protocol.

The think aloud protocol is a method used to gather data in usability testing in product design and development. Think aloud protocols involve participants thinking aloud as they are performing a set of specified tasks. Users are asked to say whatever they are looking at, thinking, doing, and feeling, as they go about their task. This enables observers to see first-hand the process of task completion (rather than only its final product). Observers at such a test are asked to objectively take notes of everything that users say, without attempting to interpret their actions and words. Test sessions are often audio and video taped so that developers can go back and refer to what participants did, and how they reacted. The purpose of this method is to make explicit what is implicitly present in subjects who are able to perform a specific task [WikiTAP].

For the partners that tried the think aloud approach the impression was that it gave less useful feedback than the more informal techniques. As already mentioned, the lack of guidance of the user led to a very high focus on the usability in expense of a focus on the concepts of the EUMIS portal. The conclusion was that the think aloud protocol would be more appropriate at a later stage in development.

3 Test report

The EUMIS portal has been demonstrated using 4 pilots that targets separate user communities to get a wide variety of feedback. Each of the pilots has been tested in isolation by different partners, but all pilots are based on the same EUMIS portal (http://eumis.nersc.no).

The main drivers for the test have been the test scenarios reported in [TOR+13]. The test scenarios give a detailed description of how the user should interact with the system and what output should be expected. The scenarios also act as a guide to help the users become familiar with the system so that they can explore it more in detail as they wish later.

In addition to the more formalised testing of the system using scenarios several test sessions, interviews, workshops and meetings have also been held to get feedback on various parts of the EUMIS portal and the services which the portal are built upon.

For the formalised tests the users filled out an evaluation questionnaire. The results from the evaluation questionnaires are found in Appendix A. In addition informal test reports were written after some tests and some user interviews. These test reports are found in Appendix B.

Table 1 shows a complete list of all users that have been involved in the testing of EUMIS outside of workshops.

Name of tester	*Description of test subject*	*Pilot*	*Type of testing*
Frode Dinessen (METNO)	Frode Dinessen works at the Norwegian Meteorological Institute where he is responsible for the development of systems for the Norwegian sea ice service.	1	Informal interview.
Øystein Godøy (METNO)	Øystein Godøy works at the Research and Development Department at the Norwegian Meteorological Institute. He is involved with research and development concerning interpretation of satellite remote sensing products in the fields of snow, sea ice, radiative fluxes, nowcasting purposes etc. System architect in the area of data dissemination systems.	1	Testing based on scenarios
Steinar Eastwood (METNO)	Steinar Eastwoork works at the Research and Development Department at the Norwegian Meteorological Institute. He is involved in the development and implementation of operational satellite based ocean processing systems and systems for data access and distribution.	1	Testing based on scenarios
Knut-Frode Dagestad (StormGeo AS)	Knut-Frode Dagestad is an expert in processing and analysis of satellite SAR (Synthetic Aperture Radar) imagery. He is working with processing and analysis of remote sensing data.	1	Testing based on scenarios
Laurent Bertino (NERSC)	Laurent Bertino is a Research Director of the Mohn-Sverdrup Center for Global Ocean Studies and Operational Oceanography	1	Testing based on scenarios

	(MSC) at NERSC, and an expert in data assimilation and numerical ocean modeling.		
Guillaume Hajduch (CLS)	CLS / DAR / Expertise & Innovation, site de Brest Head of DAR department (Division des Applications Radar)	2	Testing based on scenarios 2.1 - Oil spill drift forecasts
Christophe Carrié (LEFLOCH DEPOLLUTION)	Responsible for GIS and WEB development applications	2	Testing based on scenarios 2.1 - Oil spill drift forecasts 2.2 – Shoreline cleanup
Sylvie Ravailleau (Cedre)	Engineer for emergency response department Sylvie was involved in the “baie de seine marine pollution” exercise (in the Channel sea) during last October. Exercise with the French Prefecture of West Area	2	Testing based on scenarios 2.1 - Oil spill drift forecasts 2.2 - Shoreline cleanup
Celine Etasse (TOTAL)		2	Testing based on scenarios 2.1 - Oil spill drift forecasts 2.2 – Shoreline cleanup
Tim Smyth (PML)	Leads all activity related to the Western English Channel Observatory	3	Testing based on scenarios.
Weidong Xu (PML/MEDINA)	Ocean Colour Scientist	3	Testing based on scenarios.
Gilbert Maudire (Ifremer/IMN/IDM)	Gilbert Maudire is the head of the data management at Ifremer. Former coordinator of SeaDataNet project.	3	Testing based on scenarios
Ned Dwyer (CMRC)	Ned Dwyer is team leader of the Applied Remote Sensing and GIS group within the Coastal and Marine Research Centre, Ireland. He works in the area of climate observation systems. He is co-chair of ICAN, driving its strategy goals.	4	Demoed EUMIS as a precursor to NETMAR impact assessment interview. Received feedback on the EUMIS.
Kathrin Kopke (CMRC)	Kathrin Kopke is a researcher within the CMRC Governance group. She works in the area of coastal management and planning. She is data manager for the Marine Irish Digital Atlas (MIDA), and is actively involved in ICAN workshop facilitation and outreach/education work.	4	Demoed EUMIS as a precursor to NETMAR impact assessment interview. Received feedback on the EUMIS.
Christian van den Bosch (CMRC)	Christian van den Bosch is an IT researcher within the CMRC Geomatics group. He works in the area of web software development for environmental data management.	4	Testing based on scenarios

Deirdre McElligott (CMRC)	Deirdre McElligott is a researcher within the CMRC Marine Ecology group. She works with GIS and Remote Sensing to uncover correlations between seabird distribution and oceanographic variables.	4	Testing based on scenarios
Liz O'Dea (Washington State Department of Ecology)	Liz O'Dea is employed by the Washington State Department of Ecology, USA. She works on the Washington Coastal Atlas. She is co-chair of the ICAN Technical Working Group.	4	Demoed EUMIS during a video conference call. Received feedback on the EUMIS.
Tanya Haddad (Oregon Coastal Management Program)	Tanya Haddad is employed by the Oregon Coastal Management Program at the Oregon Department of Land Conservation and Development, USA. She works on the Oregon Coastal Atlas (OCA). She has voluntarily connected test data from the OCA to the EUMIS search client under the auspices of the ICAN Technical Working Group.	4	Demoed EUMIS during a video conference call. Received feedback on the EUMIS. Also a user of NETMAR semantic cookbooks.
David Hart (University of Wisconsin Sea Grant Institute)	David Hart is employed by the University of Wisconsin Sea Grant Institute, USA. He works on the Wisconsin Coastal Atlas and is a member of the ICAN Technical Working Group.	4	Demoed EUMIS during a video conference call. Gave feedback on the EUMIS.
Dominic Lowe (British Atmospheric Data Centre)		NVS	
Simon Cox (CSIRO)		NVS	
Stewart Bernard (CSIR/UCT, ChloroGIN)	Coordinator of ChloroGIN-Africa.	3	Remote demonstration based on scenarios.
Andy Rabagliati (CSIR/UCT, ChloroGIN)	Programmer	3	Remote demonstration based on scenarios. Local, unstructured exploration of portal

Table 1: List of consulted users

Table 2 list workshops where the EUMIS portal has been demonstrated and feedback from the demonstration has been recorded.

Workshop	***Description of test subject***	***Pilot***
END USER MEETING Ifremer Center – brest, June, 12 2012	Presentation and demonstration of EUMIS portal (demonstration of Oil Spill Forecasting & Cleanup site) Discussion of experiences with solutions for	2

	searching, displaying, sharing oceanographic datasets. Feedback from users regarding the GIS viewer. • Michel Bellouis, (Ifremer) • Catherine Satra Le Bris, (Ifremer) • Erwann Quimbert (Ifremer) • Julien Meillon, (Ifremer) • Etienne Laffay, (Ifremer) • Lucie Bizzozero, (Ifremer) • Pierre Vigné (CETE Normandie-Centre) • Cécilia Pignon, (UMR LIENSs - La Rochelle) • Benoit Soulard, (Ifremer) • Michel Ropert, (Ifremer) • Sandrine Vaz, (Ifremer) • Benoît David, (MEDDTL) • Steven Piel, (AAMP)	
International Coastal Atlas Network (ICAN) - Meeting of European and African participants, Monday 26th November 2012 (2:00pm – 5:30pm), IODE, Ostend, Belgium	Demoed EUMIS and received feedback. Organisations represented at the meeting included: • Australian Ocean Data Centre Joint Facility – Australia • Kustbeheer – Belgium • Coastal & Marine Union (EUCC) – Belgium • International Oceanographic Data and Information Exchange (IODE) – United Nations • CARIS – The Netherlands • Satellietgroep – The Netherlands • Marine Board – Belgium	4

Table 2: List of workshops where users have given feedback to EUMIS

3.1 Feedback from testing

The feedback from the testing can be divided into two different types. We have quantitative feedback in the portal evaluation questionnaire (e.g. the users satisfaction with a part of the portal) and we have qualitative feedback based on comments in the portal evaluation questionnaire and on the test reports. A summary of the quantitative feedback is found in chapter 3.2. We categorised the qualitative feedback into

- General comments about the portal and the NETMAR concepts.
- Portal implementation bugs
- Suggested improvements

- Requests for additional data

This feedback is found in Tables 3, 5, 4 and 6 respectively.

Keep in mind that the line between the different categories is not always clear cut and there is a sliding scale between what is a considered a bug and what is considered an improvement. In general a bug is something that should have worked but didn't and an improvement is any other comment to the portal implementation on things that could be done differently.

3.1.1 *General comments*

Table 3 summarises a number of general comments from the users that has been recorded both in the portal evaluation questionnaires and in the test reports. The overall tone of the feedback is positive and as expected different users highlight different parts of the portal as relevant. Several users highlight the use of service chains as an interesting concept due to easier dissemination of algorithms or reuse of workflows. The service chaining editor has the potential for easier prototyping of new data services and exploratory data analysis and also for making it easier to share new service chains either as part of scientific papers or as part of a normal work day. The ability to display data from different providers and the use of controlled vocabularies in the metadata was highlighted by some users.

Several users also highlighted that the EUMIS portal did not offer anything new with regards to existing efforts and they wondered both about the sustainability of the portal and the relationship to other portal initiatives.

General comment	*Reporter*
There are many different uses for this type of system in users daily operations. The user has to produce a number of ice charts daily and the production of these charts depending on several processing chains. Using EUMIS to re-project, re-sample and other type of processing could be very useful. Many of these operations are can be performed today on the command line, but providing them via web can be useful as not everyone is comfortable with using the command line and the correct programs are not always available.	Frode Dinessen
The search client was well organized with easy to navigate hierarchy of keyword, and the search was quite fast. The ability to add retrieved layers directly to the GIS Viewer is also appreciated. The GIS viewer was found to be powerful, allowing overlay of many layers, flexible selection of dates (for individual layers), and manipulation of color and transparency. The fact that layers added in the search client were kept, meaning multiple layers from different searches could be added, was also found attractive, as was the ability to store the current set of layers and map layout in a file for later use. The concept of service chaining was seen as interesting, and could be used for instance to dynamically compare satellite observations/analysis and model forecasts of the same parameter. This could be a valuable add-on service to the EUMIS portal.	Laurent Bertino
The concepts and tools demonstrated, such as the semantic search and WPS services, were interesting and useful to exploit. However, any system to be used by our company in our daily works *must* run 24/7 and guarantee an uptime on the order of 99%.	Knut-Frode Dagestad
A very useful system that needs to be ”sold” to the community more. It has great potential for the modeling community in allowing them to build **visualisation** service chains accessing data generated by models on supercomputers such as HECTOR. To promote this there need to be concrete examples complete with data. If this is taken up by the scientific community it will increase traceability in papers as the workflows used in processing the data could be published along with the raw data allowing peers to reproduce the results. When used with additional technology it could mitigate the massive increase in data volumes by allowing researchers to extract ”information” from ”data” The approach looks good but needs to be sold to the community much more vigorously. The portal is not suitable for use without some training so there needs to be more outreach. It wasn’t very obvious where the quality information fitted in to the system.	Tim Smyth
Dr Xu thought the system could be useful to him in his research. He was particularly interested in data discovery using the semantic search and reprojection using the service chaining editor. He would have like more “community” features on the portal itself, such as an area where users could post their own examples.	Weidong Xu
A benefit of EUMIS is better preview and structure compared to e.g. googling “blue flag beaches”	Christian van den Bosch

Carefull with different timesteps of the different data : for example : timestep of currents and model results are not the same and may generate interpretation errors.	Sylvie Ravailleau
Compared to DYNMAP server, the EUMIS viewer does not provide many other functionalities	Sylvie Ravailleau
Interogation : wich is the relation / articulation with other project from GMES, exemple : MYOCEAN etc ... There are already some similar tools in MYOCEAN (catalogue search client, data workflow etc ...)	Guillaume Hajduch
The EUMIS portal does not really improve the access, the search or the representation of the cleanup sites and observations data compares to DYNMAP.	Christophe Carrié
Reliance in data providers is a weakness of the system.	Christophe Carrié
Oil spill comparison is interesting, but will it be available during a crisis.	Christophe Carrié
Public access to cleanup site and shoreline pollution information is a benefit of the portal	Sylvie Ravailleau
Use of controlled vocabularies was very interesting	Tim Smyth
Overall impressed with portal. It has a lot of potential and would like to use in future. Please develop it.	Weidong Xu
A very useful system that needs to be presented to different users and projects. It has great potential for allowing data display for different data types (satellite, in-situ, model outputs) and from various data sources. It could also facilitate the retrieval of data sources via the distributed catalogue and the common vocabularies and ontologies. The approach looks good but needs to be made more user friendly. At the moment, the portal is not fully suitable for use without some training or demonstration.	Gilbert Maudire
CSIR/UCT are concerned about the increasing size of EO data, they are interested in how NETMAR addresses this. CSIR/UCT were also in agreement with the overall architecture of the service chaining system. As workflows pass data by reference data transfer between systems is minimised. This helps with the data issue above. This also means that the service can be used by people who do not have advanced processing facilities (all the work can be done through the web interface and run on remote systems). CSIR/UCT find most large portals to be too complex. Simplicity is important - EUMIS is better than most. CSIR/UCT liked that the portal returned a manageable number of layers from the search.	Stewart Bernard and Andy Rabagliati
The users like very much the GIS viewer in particular the comparison of oil spill drift models (MOTHY, OILMPA, METNO models). They are very interested in oceanographic data access in 4D (Latitude,	END USER MEETING Ifremer Center – brest, June, 12 2012

Longitude, Elevation, time step).	
More intuitive interfaces required for future exploitation. More video tutorials required for future exploitation. Still a demonstrator, another step to become an operational service. Need to work with user communities to scope and detail the services required for operational use. Challenge will be to make technologies understandable to atlas developer community in order to facilitate a wide uptake Underlying technologies demonstrated will be valuable for demonstrating Coastal Web Atlas interoperability	Ned Dwyer
Potential to extend the current thematic ICAN use case (i.e. coastal erosion semantic use case) Would like to some training to teach people how to use these technologies NETMAR outputs useful as guidance in the revamp process of MIDA web GIS which is outdated, as best practice guidelines, capability building	Kathrin Kopke
I'd just like to say thanks to the NETMAR team for an excellent job on the cookbooks – they really are very useful. Just today I was able to make spontaneous photocopies of pp3-5 in the semantic cookbook (with the cookbook cover sheet as citation) for use as a handout at an internal agency discussion about vocabularies. It was helpful for people to have as a quick reference.	Tanya Haddad

Table 3: General comments about EUMIS from testers

3.1.2 *Suggested improvements*

The testers reported a large number of suggested improvements to the portal. We have categorised these improvements as

- Usability for improvements regarding the usability of the system.
- Functionality for improvements regarding additional functionality to be added to the system.
- Documentation for improvements regarding request for more documentation
- Other is used for all other improvements that do not fit into the other categories.

In total 54 suggested improvements were reported.

- 29 were regarding usability
- 13 were request for additional functionality
- 6 were requests for more documentation
- 6 did not fit into any of these categories.

A description of the suggested improvement along with the reporter and the type of improvement is found in Table 4.

Suggested improvement	*Reporter*	*Type*
In the WPS execution dialog in the GIS viewer it would be nice with some more help in selecting the correct input	Steinar Eastwood	Functionality

values. For instance a calendar widget for dates.		
The WPS result in the GIS viewer has no legend.	Steinar Eastwood	Usability
It was hard to close the WPS dialog since the close button was located outside of the current browser window. The browser had to be maximized for the dialog to be closed.	Steinar Eastwood	Usability
Pressing the enter key instead of clicking the “Ok” button in the add layer dialog in the GIS resulted in a page refresh.	Steinar Eastwood	Usability
For the ice drift data it would be preferable if was visualized as a vector instead of as two values.	Øystein Godøy	Functionality
The label on the “Search Data” button to the left in the discovery client is truncated and not possible to read completely.	Steinar Eastwood	Usability
The range should be automatically set for the “sea_ice_classification” dataset provided by METNO.	Steinar Eastwood	Usability
OSI SAF metadata might be improved with a OpenDAP link.	Steinar Eastwood	Functionality
Users can become confused by the output from the WPS execution in the GIS viewer. The XML response that is displayed in the WPS dialog has no meaning to them. A simple message with passed / failed might have been better. The full response could be viewed as an option.	Øystein Torget	Usability
The “Find Data” button on the Thesaurus page could be a bit difficult to find the first time.	Øystein Torget	Usability
User double clicked the “Display in GIS viewer” due to slow response time from the server.	Øystein Torget	Usability
Search in the Thesaurus can easily be confused with searching for data.	Øystein Torget	Usability
Polar Stereographic projection for the Antarctic should be implemented in the GIS viewer.	Laurent Bertino	Functionality
It should be easier to find information / get help as a new user.	Knut-Frode Dagestad	Usability
The data link in the search client should be fewer clicks away; it could be shown on the Summary tab.	Knut-Frode Dagestad	Usability
VerifyConcept method in NERC Vocabulary Server can use 404 to signify “not verified” to be more inline with REST principles.	Simon Cox	Other
Include formal descriptions of the use of SKOS collections and concept schemes	Simon Cox	Other
Tidy up the documentation of relationships / mappings with in the NERC Server	Simon Cox	Documentation

Tidy the documentation of the URLs used to call the NERC Vocabulary Server	Simon Cox	Documentation
Expand the documentation of the NERC Vocabulary Server to include some information on the maintenance / versioning model	Simon Cox	Documentation
Support for animation of the oil slick drift model together with the currents and winds data would be useful.	Celine Etasse	Functionality
Management of layers in the GIS viewer could be improved.	Celine Etasse	Usability
Date navigation is not very easy to use. You need to select a date for each layer and often the time as well. Can scenes be amalgamated to allow easier matching with daily data?	Tim Smyth	Usability
The WPS oil spill comparison model (Kolmorogov-Smirnof oilspill model results comparison WPS service) is quite difficult to interpret for an operational user (and not a scientist).	Celine Etasse and Sylvie Ravailleau	Other
Add legend and other additional information to the printed map	Celine Etasse and Sylvie Ravailleau	Functionality
The map palette/legend is hard to find. (If you have a large number of layers it does not show in the window)	Tim Smyth	Usability
WPS execution output only displays XML. User needs to cut and paste URL of image to view it.	Tim Smyth	Usability
Find other WPS services, for example : process the integration of various input data model (MOTHY, OILMAP, METNO …)	Sylvie Ravailleau	Functionality
Not immediately obvious what to do after SCE has started.	Tim Smyth and Weidong Xu	Usability
Service Chaining editor need example workflows.	Tim Smyth. Weidong Xu and Gilbert Maudire	Documentation
WPS execution not user-friendly.	Weidong Xu	Usability
Not obvious what to click on to start searching for data.	Weidong Xu	Usability
Not obvious how to download data.	Weidong Xu	Usability
Navigation is somewhat inconsistent	Christian van den Bosch	Usability
Thesaurus (browse view) = options (search view)	Christian van den Bosch	Usability
Symbology should be improved for pilot 2	Christophe Carrié	Usability
Search does not recognise plural terms	Deirdre McElligott	Functionality
Too many clicks to see full metadata	Deirdre McElligott	Usability
After viewing examples GIS viewer does not go back to default.	Deirdre McElligott	Usability

Extend to other geographical areas (LEFLOCH DEPOLLUTION works in Europe but also for African countries)	Christophe Carrié	Other
Produce more help information for portal to be easier to use without external help (for non-trained people).	Gilbert Maudire	Documentation
Consider improvements of user interface and online help.	Gilbert Maudire	Documentation
Consider normalization (WPS) of workflow services.	Gilbert Maudire	Other
Search button can be difficult to find	Christian van den Bosch	Usability
It should be possible to download the metadata XML file.	Christian van den Bosch	Functionality
Should be possible to re-initialise the GIS viewer	Christian van den Bosch	Functionality
Search client does not remember state when moving between GIS viewer and search	Christian van den Bosch	Usability
Plural terms should not return different results	Christian van den Bosch	Functionality
Download after preview is difficult	Christian van den Bosch	Usability
Online documentation is difficult to open and consult.	Guillaume Hajduch	Usability
Lack of “HELP” tool.	Guillaume Hajduch	Functionality
If the SCE is to be used by general users it could do with some simplification, for instance automatically decoding base64 to image for display.	Stewart Bernard and Andy Rabagliati	Usability
Add animation of oil slick drift together with wind and currents.	END USER MEETING Ifremer Center – brest, June, 12 2012	Functionalities
The displayed current should be the same than the current use for the calculation of the oil slick drift.	END USER MEETING Ifremer Center – brest, June, 12 2012	Other

Table 4: Feedback on suggested improvements from testers

3.1.3 *Portal implementation bugs*

A number bugs were reported during the second test phase. We have categorised the bugs as either Major or Minor.

- Major: A major issue has severe impact on users’ ability to use the system as intended.
- Minor: A minor issue has a small negative impact on the users’ ability to use the system as intended.

In total 18 bugs were reported, 8 of them minor and 10 major. The list of reported bugs can be found in Table 5. At the time of writing several of these bugs have already been fixed.

Issue	*Reporter*	*Severity*
The discovery client is too slow. This goes both for the look up in the thesaurus that takes a long time to load the list of parameters and in the search that takes too long give the users a response.	Steinar EastWood and Øystein Godøy	Minor
The legend for the layers contains French words.	Steinar Eastwood	Minor
The stereographic projection in the GIS viewer does not work for some of the datasets delivered by METNO, but it works for others.	Steinar Eastwood and Øystein Godøy	Major
The dataset “Arctic ice concentration maps from SSMI data based on the NORSEX algorithm” cannot be displayed in the GIS viewer. Instead an error message is displayed.	Steinar Eastwood and Øystein Godøy	Major
The search client appears to give the wrong number of results when search for sea ice. At least three datasets from OSI SAF contain sea ice in either the title or the abstract. However only two datasets are returned. When searching just for “ice” the datasets from OSI SAF are found.	Steinar Eastwood	Major
OpeNDAP link was missing from the “ Arctic ice concentration maps from SSMI data based on the NORSEX algorithm” dataset under “Data links” in the discovery client.	Steinar Eastwood	Major
Links to data from Search pages did not work for the datasets that was tried	Tim Smyth	Major
The polar stereographic projection didn’t seem to work properly; layers from METNO and NERSC were positioned correctly relative to each other but not relative to the background layers (coastline, bathymetry)	Laurent Bertino and Knut-Frode Dagestad	Major
Multilingual search did not appear to work.	Tim Smyth	Major
The logarithmic scale does not appear to work correctly.	Tim Smyth	Minor
It is not possible to set the scale manually or in units of less than 1.	Tim Smyth	Minor
Transect and time-series options were offered but did not produce output. (Probably due to popup blocking in browser)	Tim Smyth	Minor
Unable to run the search client on own computer as the version of Flash was not compatible.	Weidong Xu	Major
The attribute data display does not work correctly (bug with cleanup site attribute data)	Christophe Carrié	Major
The cleanup site statistics are not available for pilot 2	Christophe Carrié	Minor
Attribute data was missing from pilot 2	Sylvie Ravailleau	Major
Some metadata records are missing thumbnails	Christian van den Bosch	Minor
If user navigates back to the Thesaurus “Search” tab, user is not able to re-select the previously selected term in the list.	Christian van den Bosch	Minor

Table 5: Issues found during testing

3.1.4 *Request for additional data*

In total 11 requests for additional data were recorded. This does not directly translate to 11 additional datasets as the request in many cases covered broader categories of data that the users would like to see in the portal. It is therefore important to go into a close dialogue with the users before more data is added to the portal. The list of additional requested data can be found in Table 6.

New data	*Reporter*
Sensitive area (economical, ecological, geomorphological sensitivity)	Guillaume Hajduch
Data from external providers (e.g. more met-ocean and ice model forecasts) should be inserted.	Laurent Bertino
POLREP Statistics (maps and graphs)	Guillaume Hajduch
Wind from SAR	Guillaume Hajduch
Raster of IGN/ SHOM (maritime and shoreline maps)	Christophe Carrié
Thermocline / salinity	Christophe Carrié
Nature of seabeds	Christophe Carrié
Raster with local information (name of cities, roads, administrative limits)	Sylvie Ravailleau
Graticule information (grid / latitude longitude)	Sylvie Ravailleau
More data like SSH , front and Phenology.	Weidong Xu
Datasets that cover Africa	Andy Rabagliati

Table 6: Suggestions for new datasets from testers

3.2 Summary of portal evaluation questionnaires

The portal evaluation questionnaires completed as part of the second test phase contain valuable feedback on the EUMIS portal and on the technologies developed as part of NETMAR. To better analyse the information from the forms we have summarised the information in the tables below. Whilst this summary gives a nice overview of the information from the forms it is important to be aware of that the forms contain additional information that is not captured in the tables below. All of the completed portal evaluation questionnaires can be found in Appendix A.

3.2.1 *Importance*

Table 7 summarises the information from the portal evaluation questionnaires with regards to what was the most important functionality in the portal for the user. The users rated different parts of the portal functionality on a scale of 1 to 5 where 1 stands for “not important” and 5 stands for “very important”. The number in each cell represents the number of users that gave that score to each area of functionality. As we can see from the numbers

searching for and displaying data is now the most important for the users. Support for multiple languages is the least important. As we can see from the numbers there has been some shift in focus from the users in what is most important to them. Search for specific information has increased quite a lot while combining data from different providers has decreased. One explanation of this could be that the sample set is not large enough to even out the slightly different preferences between the users in the first and the second test phase.

Table 7 Summary of importance of portal functionality.

Portal functionality	***1***	***2***	***3***	***4***	***5***	***NA***	***Avg***	***Previous average***
Search for specific information.			2	2	11		4.6	4
Display a combination of data from different providers	2		3	2	8		3.9	4.7
Display a combination of different types of data	1	2	2	3	7		3.9	4.5
Build customised workflows to process data	2	2	6	3	1	1	2.9	3.1
Gaining knowledge of data quality			1	9	3	2	4.2	3.6
Downloading data	1			6	8		4.3	3.8
Support for your native language	4	5	1	2	3		2.7	2.6
Support for multiple languages	7	3	1	2		2	1.8	1.8

The results are also summarised graphically below, ordered by average importance. The colour coding in the bar chart represents the proportion of answers in each category (1-5).

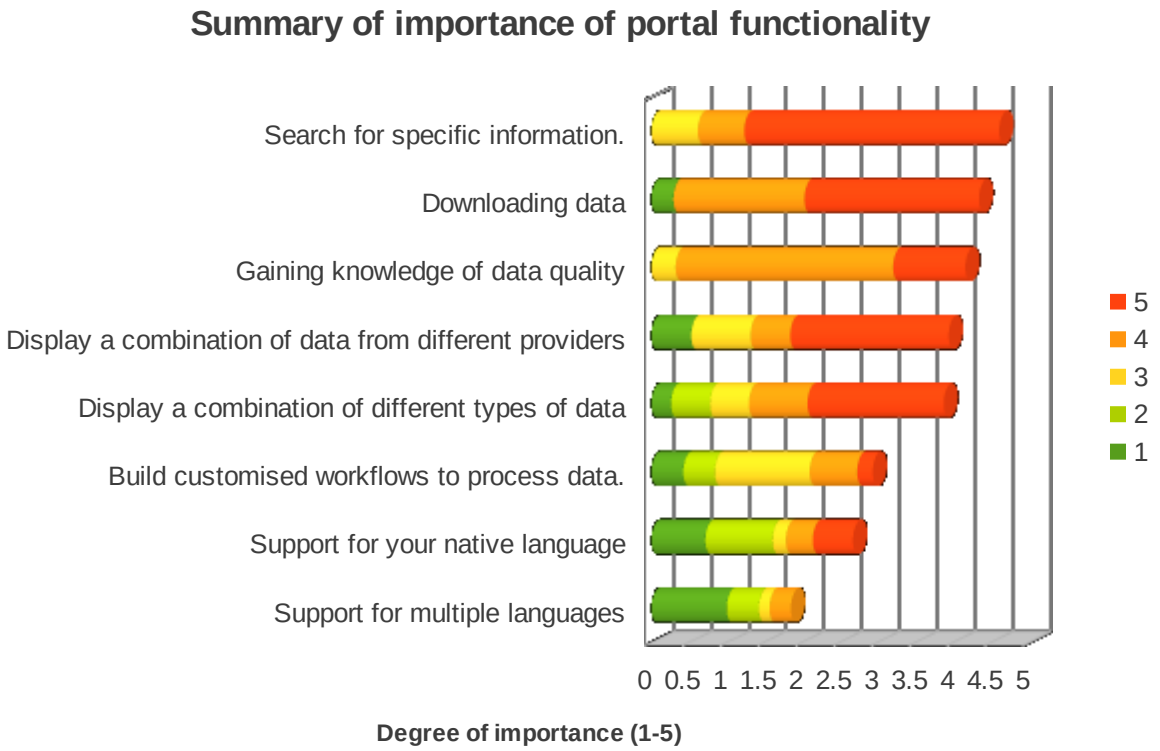

Figure 1: Summary of how users rated importance of portal functionality

3.2.2 *Satisfaction*

Table 8 summarises the information from the portal evaluation questionnaires with regards to the users' satisfaction with the different portal functionalities. The users rated their satisfaction on a scale of 1 to 5 where 1 stands for "unsatisfactory" and 5 stands for "very satisfactory". The number in each cell represents the number of users that gave the score to each functionality.

As we can see the user satisfaction with the system overall is satisfactory, but not good. The positive thing is that there has been an increase in satisfaction with the system on all aspects but one. In some case the increase in satisfaction is 2 or more. This shows that the improvement in the last year of the project has been significant and that the portal is on the right track.

Table 8 Summary of satisfaction with portal functionality.

Portal functionality	*1*	*2*	*3*	*4*	*5*	*NA*	*Avg*	*Previous average*
Search for specific information.			7	5	1	2	3.5	2.6
Display a combination of data from			6	2	6	1	4.0	2.1

different providers								
Display a combination of different types of data		1	5	1	6	2	3.9	2.6
Build customised workflows to process data	2		2	2		8	2.7	1.8
Gaining knowledge of data quality	1		6	4	1	3	3.3	2.7
Downloading data		1	4	2	2	6	3.6	1.5
Support for your native language	3		1		5	8	3.4	2.4
Support for multiple languages	3		2		1	9	2.3	2.3

The results are also summarised graphically below, ordered by average satisfaction. The colour coding in the bar chart represents the proportion of answers in each category (1-5).

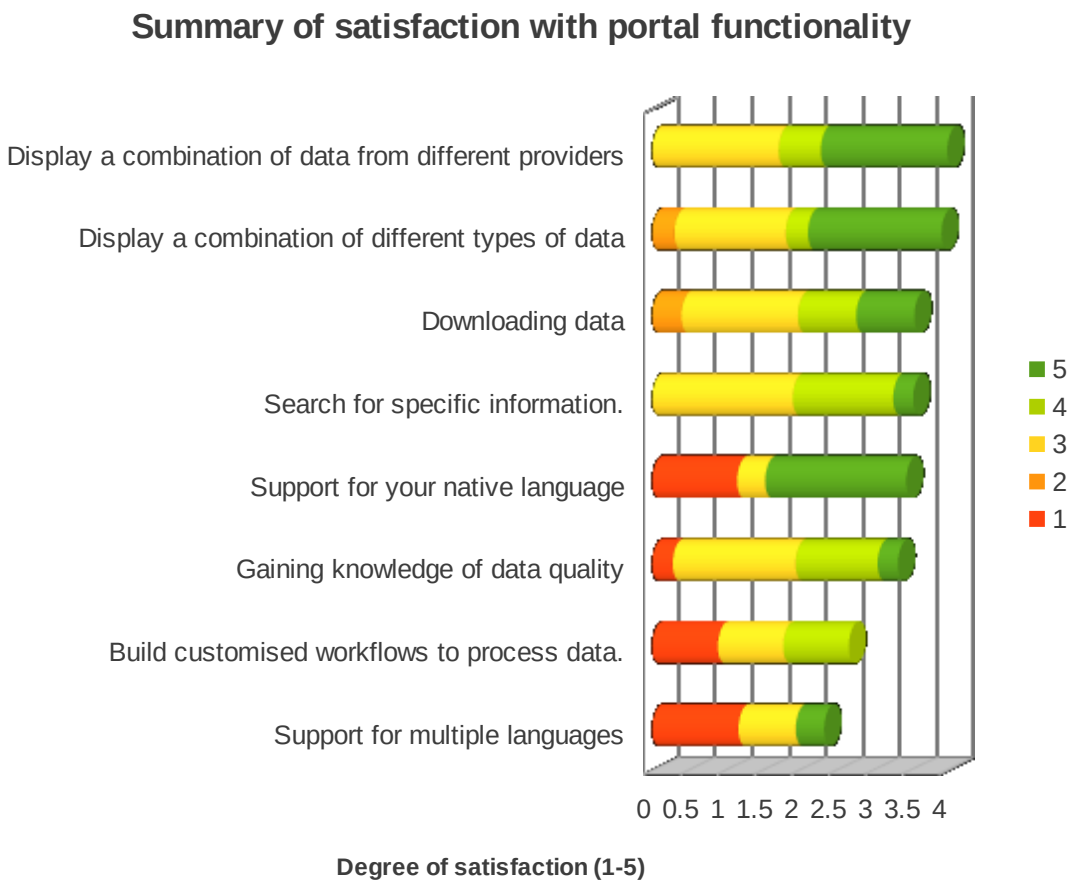

Figure 2: Summary of how users rated satisfaction with different parts of the portal

3.2.3 *Summary of questions*

Table 9 summarises question 4.1 to 5.3 from the portal evaluation questionnaire. In Table 9 the following translation was used to map the textual answers to numbers

1. Totally disagree
2. Partially disagree
3. Neither agree or disagree
4. Partially agree
5. Totally agree

The numbers reported for the second test phase were similar to those reported in the first test phase and show that the portal still needs more data and a high focus on usability together with a focus on helping the users accomplish their tasks. Comparing Table 9 with Table 8 it appears that the overall increase in satisfaction with the system is not directly

related to improved usability and perhaps is more connected to the fact the portal as a whole is much more complete.

Table 9 Summary of answers to quantifiable questions.

Portal functionality	1	2	3	4	5	NA	Avg	Previous avg
4.2 Is the provided information relevant for your needs?	1		2	8	6		4.1	4
4.3 Is the provided information sufficient for your needs?	1	2	4	10			3.4	2.6
4.4 Is the provided data quality information sufficient for your needs?	1	2	9	4	1		3.1	2.9
5.1. Is the portal user-friendly?	2	5	2	6	2		3.1	3
5.2. Is the portal well-structured?			4	10	1		3.8	3
5.3. Is the portal useful for accomplishing your tasks specified above (3.1.)?		7		8	1		3.2	3.2

The results are also summarised graphically below. The colour coding in the bar chart represents the proportion of answers in each category (1-5).

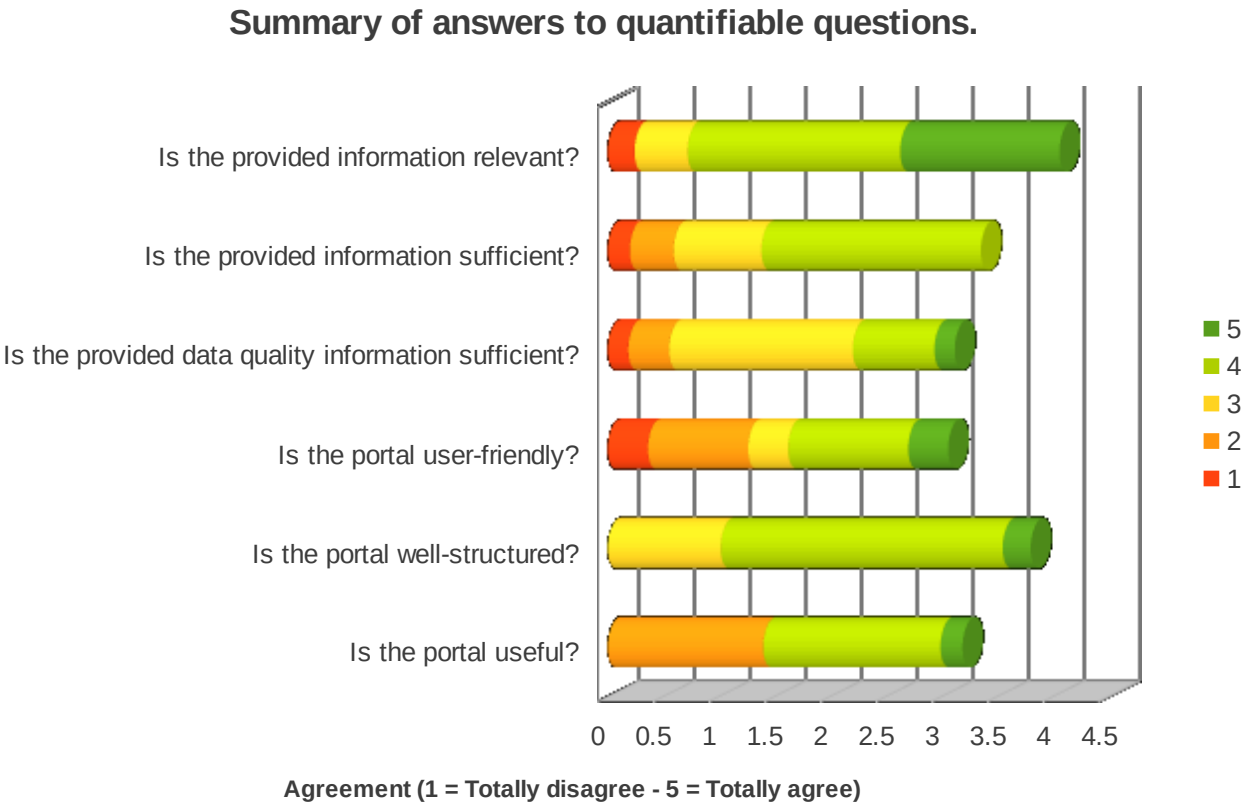

Figure 3: Summary of users rating of question 4.2, 4.3, 4.4, 5.1, 5.2 and 5.3

Table 10 summarises the answers to the question “5.6 What do you think is most important for improving the NETMAR portal?”.

The addition of more data and the usability of the portal are still the most important areas to improve. However the performance of the portal has also become an area to focus on.

Table 10 Summary of answers to question 5.6.

Alternative	***Number of answers***	***Previous number of answers***
Additional data and/or information	12	9
Different organisation of the data/information	1	1
Improved user interface	7	4
Translation into my native language	0	2
Support for more languages	0	0
Better performance	5	2
Other	1	0
Blank	0	3

Table 11 summarises the answers to the question “5.7. What benefits have you experienced from use of the portal?”. This shows good improvements in a number of areas such as data search and service chaining.

Table 11 Summary of answers to question 5.7.

Alternative	***Number of answers***	***Previous number of answers***
Easier to find relevant data	8	1
Easier to display and download data	6	3
Possibility to compute new parameters on the fly using available service chains	2	1
Possibility to construct my own service chains	4	0
Learn about new technologies and tools	4	5
Other	2	0
Other: basic tool for communication purpose	0	2
Other (access to public data on the GIS viewer)	1	0

Blank	0	4

4 Evaluation of EUMIS portal

The second test phase has given a wealth of feedback on the EUMIS portal from the user community. The detailed and specific feedback has been recorded in sections 3.1 and 3.2, here we will evaluate the portal based on this feedback.

The general comments from users regarding the portal were positive. This is especially noticeable with respect to the concept of the service chaining editor, the ability to display different types of data from several providers and use of controlled vocabularies in the metadata. There are probably several reasons for these areas being highlighted by the users

- The support for a web-based service chaining editor is novel so it is therefore understandable that it is one of the features that stand out in the portal. Though on-demand processing is offered elsewhere in many different settings the support for making your own processing chains in this way and executing them in a portal is new.
- Displaying different types of data from different providers is a common task for many of the users so that some of them also highlight it specifically is expected.
- The use of controlled vocabularies and semantics in the metadata is not apparent to many end users, but for users that are service providers this technology is of vital importance to achieve good interoperability across data providers and user communities.
- For all of the above they are key aspects of the EUMIS portal, they have therefore been the focus of testing from test partners and it is likely that at least some users have been specifically asked for feedback on the topics. In that regard it is good that the feedback on the topics is positive.

In addition to the positive feedback on the portal concepts, several users also pointed out that while the EUMIS portal did work it did not offer them anything new compared to what they already could find in other portals. We think that the main reason for this is that a large number of users have simple needs and do not need smart search or service chaining capabilities. If the user never uses the smart search and instead always uses free text search the gain from ontologies is limited. The same goes for users that only wish to view data and not generate new data. They only need a GIS viewer and not a service chaining editor. For these users it would be hard for them to see the usefulness of the new approach even if they would benefit from it in the end. What they want instead is more data, better usability and better performance than existing systems. Since the EUMIS portal is a prototype it cannot offer these 3 features to most users and it then falls into the category of “yet another portal”.

Compared to the first test phase, users' satisfaction with the portal has increased greatly. We think this is because of three major factors.

1. several usability issues have been resolved,
2. a higher focus on internal testing in the last year of the project,
3. the portal is now much more complete than it was during the test phase.

However many usability problems still exist, something that is reflected by “Improved user interface” being second most requested improvement in the portal questionnaire. It is also emphasised by the fact that about half of the 51 suggested improvements to the EUMIS portal were related to usability.

While usability certainly is important, one should be careful not to put too much weight on the fact that a large number of usability improvements have been suggested compared to other feedback. Most of the users that have been part of the testing have only seen the system for a short amount of time and usability issues are both found quickly and easy to report. If the

users had been given more time it is expected that the focus on reported issues would shift more over to wanting either more data or new functionality. That being said good usability is a corner stone of having happy users and not at least in attracting new ones.

The test phase also found 17 new bugs, of which 9 were considered major bugs making it hard for the users to complete their task in the portal. This is too many and gives a clear indication that the portal would have benefited from having 3 formal test phases instead of 2. Having an additional test phase would have uncovered many of the reported bugs and these could have been fixed before a final test phase. With a slightly different project schedule that allowed time for a third test phase we think that the number of bugs in the portal could be decreased and the user satisfaction increased.

5 Conclusions

More than 40 people have participated in the testing of the EUMIS portal, either through formal testing using predefined scenarios, user interviews and demonstrations or larger workshops. The feedback from the testing has been recorded both in portal evaluation questionnaires for the more formal testing and in test reports.

Both the qualitative and quantitative feedback from the testing has been categorised and summarised. The main conclusions from the testing is that

- The users like the concepts (service chaining, semantic search and display of different types of data from different providers) that are demonstrated by the EUMIS portal.
- There has been a significant increase in the user satisfaction with the portal compared to the first test phase. This is most likely due to the fact that the portal is now complete and contains improved implementations of the portal components and more data.
- There are still some bugs in the implementation and the users also reported a number of usability issues.
- There was need for more documentation and training material in how to use the portal.

Overall the feedback has been positive and any further development of the portal components should focus improved usability coupled with good training material in the form of online help tools, more cookbooks and video demonstrations.

6 References

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[WikiTAP] Wikipedia. http://en.wikipedia.org/wiki/Think_aloud_protocol. Accessed on 25th November 2011.

Appendices

Appendix A. Completed portal evaluation questionnaires